

Land Off Bluebell Way, Preston East, Lancashire



Archaeological Evaluation Report



Oxford Archaeology North

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**James Hall and Company
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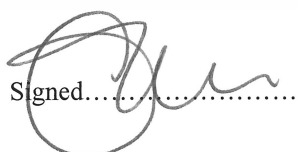
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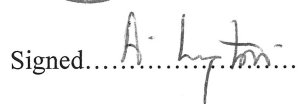
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SUMMARY

Following a proposal for a development on a 2.42ha area of land at Preston East, Bluebell Way, Preston, Lancashire, (centred on NGR SD 571 329), an Environmental Impact Assessment was carried out to accompany the planning application for the site, and a programme of evaluation was agreed with the Lancashire County Archaeology Service (LCAS), specifically to undertake a geophysical survey and subsequent targeted trial trenching to understand the potential impact of the proposed development on the cultural heritage resource. Oxford Archaeology North was commissioned by James Hall and Company (Properties) Ltd to undertake the work. The evaluation was completed in November 2011.

In total, nine trenches were excavated, targeting those potential features identified during the geophysical survey; archaeological remains were recorded in five of the trenches. Within Trenches 4 and 5, a large field boundary ditch (**404** and **503**), as identified in the geophysical survey, was observed, and most likely represented a post-medieval field boundary seen on the First Edition OS map of 1849. However, by the OS map of 1893 it had been backfilled and straightened to the form of the existing boundary. There was no evidence for the bank or earthwork in the geophysical survey results, suggesting that perhaps it had been used to backfill the ditch, and the ploughed-out remnants were not distinguishable from the topsoil.

Additional post-medieval boundary ditches and drainage gullies were recorded in Trenches 4 and 7. Ditch **409**, in Trench 4, appeared to be a contemporary internal division within the field boundary defined by ditch **404** and **503**, but was not present on the 1849 OS map; it defined broadly an area which was identified as possible compacted ground in the geophysical survey. A second boundary ditch, **702**, in Trench 7, was also not present on the 1849 OS map, but the fills and the small amount of post-medieval pottery retrieved would suggest a similar date to the main boundary ditch **404/503**. The palaeoenvironmental data collected from the ditches confirmed the presence of waterlogged remains, consistent with a wet environment.

In Trenches 1 and 3 curvilinear gully features (**104** and **108**) were recorded during the trial trenching, but there was no evidence by which they could be dated. It is possible that they were of possible agricultural origin. However, it cannot be ruled out that they are of possible archaeological origin.

The remaining general geophysical anomalies were observed in the trenching to relate to changeable natural geology, and in Trenches 2, 6, 8 and 9 there were no archaeological remains present.

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The fieldwork was undertaken by Becky Wegiel, assisted by Vickie Jamieson and John Onraet. The report was written by Becky, with the drawings produced by Anna Hodgkinson. Chris Howard-David commented on the finds, and Denise Druce undertook the palaeoenvironmental assessment. The project was managed by Emily Mercer, who also edited the report.

1. INTRODUCTION

1.1 □ CIRCUMSTANCES OF PROJECT

- 1.1.1 Planning permission was granted for the Preston East development, positioned between Fulwood and Grimsargh, following the submission of an Environmental Impact Assessment (EIA) to accompany the planning application (GVA Grimley 2006). The proposed development is for industrial/warehousing and distribution uses, together with business units, which has been parcelled into Areas A-D. Incorporated within Area A is an area of land measuring 2.42ha immediately to the north of Bluebell Way, Preston, Lancashire. The EIA found the area to have a potential for medieval and post-medieval remains, of likely agricultural or small-scale industrial origin, to survive below ground (*ibid*). Consequently, a programme of evaluation was required as a condition to the planning permission by the Lancashire County Archaeology Service (LCAS), specifically to undertake a sample geophysical survey, which was completed in November 2011 (Stratascan 2011), and subsequent targeted trial trenching. This would enable the potential impact of the proposed development on the cultural heritage resource to be understood, and, therefore the implications for any required mitigation. To this end, James Hall and Company (Properties) Ltd commissioned Oxford Archaeology North (OA North) to undertake the work, which was carried out in November 2011.
- 1.1.2 This report sets out the results of the trenching in the form of a short document, outlining the findings and assessing the impact of the proposed development.

1.2 □ LOCATION, TOPOGRAPHY AND GEOLOGY

- 1.2.1 **Location:** the present development site lies within the M6 corridor in central Lancashire, and on the northern margins of the Ribble valley. The site, to the north-east of the Preston urban area and just off the B4242 (NGR SD 571 329; Fig 1), falls within a generally rural region that is being encroached upon by light industrial development, such as Red Scar to the south. The area to the north of the site was delineated partly by a series of strip and irregular fields typical of the wider landscape (CAP 2006, 4), and comprises green and brownfield areas. The landscape surrounding the site is typical of the Lancashire Plain and Bowland fringe area (Countryside Commission 1998, 92-93), characterised by isolated hamlets and farms, set within enclosed fields with irregular boundaries.
- 1.2.2 **Topography and geology:** the proposed development area lies approximately 60m AOD between the Savick Beck and the Blundel Brook, which flow toward the west. The solid geology of the area consists of red and green mudstones overlain by boulder clay glacial drift (Countryside Commission 1998). The soil is generally of the Salop series, which is a typical stagnogley (Lawes Agricultural Trust 1983).

1.3 □ HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

- 1.3.1 **Introduction:** the historical and archaeological background presented below is not intended to be an exhaustive account, but rather to place the site within its historical context.
- 1.3.2 **Prehistoric period:** the Ribble valley has been the focus of human activity since prehistoric times. The earliest evidence dates to the Mesolithic period (when people practised an economy based generally on nomadic hunting, fishing and gathering), and includes a mattock fashioned from red deer antler and dated to *c* 5400 BC, which was found on the banks of the Ribble in Preston (Hunt 2003, 15). Although traditionally the Neolithic period is defined by the introduction of agriculture and more permanent settlement, in Lancashire, the earlier Neolithic economy appears little different from that of the Mesolithic (Middleton 1996, 36–9). The closest Neolithic activity to the development site comprises finds of single polished axes from the Ribble Valley at Penwortham and Samlesbury Bottoms, each within 4km of the site (*op cit*, 44). Depositions of Bronze Age material are represented within the broader environs of the site, particularly in areas fringing the Ribble and its estuary. A large assemblage of artefacts was recovered during the construction of Preston Dock, a little over 7km to the south-west, which included human skulls, animal remains, two dugout canoes and a possible structure (Crosby 2000, 10–11; Middleton 1996, 46).
- 1.3.3 The Iron Age is notoriously underrepresented in Lancashire (Hodgson and Brennand 2006, 51; Haselgrove 1996, 61). This is probably influenced as much by the poor survival and identification of material of this date and the inherent difficulty of recognising potentially subtle regional site-types (Hodgson and Brennand 2006, 53; Cowell 2005, 75; Haselgrove 1996, 64) as it is by the often quoted suggestion of a low population density (Haselgrove 1996, 64). The closest known Iron Age site to the excavation area lies approximately 16km to the east, at Portfield Camp in Whalley (Cowell 2005, 68–72). It has been suggested that a promontory overlooking Clock House Farm, just over 1km to the north-east, was demarcated by a curving ditch (TC Welsh pers com), while an evaluation at Roman Way, Red Scar, located 1.5km to the south-east revealed ditches, possibly pre-Roman in origin (Earthworks Archaeological Services 2001).
- 1.3.4 **Romano-British period:** Lancashire lies within the Roman military hinterland to the rear of the Hadrianic frontier. The site is located in an area that was linked by the Roman roads that pass between the late first-century fort at Ribchester and the site at Kirkham (Buxton and Howard-Davis 2000; Howard-Davis and Buxton 2000), and between Wigan and Preston. The first of these roads passes within 1km of the site (Margary 1973, 106, road 703), and was evaluated archaeologically in the area of Red Scar Industrial Estate (LUAU 1995). The road comprised a 9m-wide cambered surface consisting of sub-rounded stones and cobbles overlain by fine gravels (*ibid*). The postulated route of the Roman road that ran between Wigan and Walton-le-Dale, and then onto Lancaster (Margary 1973, 359, road 70a) lies approximately 4km to the west of the proposed development area, close to the position of the current A6 (Philpott 2006, 60). Walton-le-Dale was a significant industrial centre during

the Romano-British period. Considering its position within the riverine and road network; it may have functioned as a part of a system of supply bases (*op cit*, 70; 75).

- 1.3.5 **Early medieval period:** following the withdrawal of the Roman military presence in the fifth and sixth centuries, several small kingdoms were established (GVA Grimley 2006). During the late sixth and early seventh centuries these were taken over by the Kingdom of Northumbria, which reached its peak around the ninth century and was followed by a period of political instability. Archaeological evidence for early medieval activity in the wider locale is not particularly widespread, but is extremely significant: the largest Scandinavian hoard in north-west Europe was found at Cuerdale, 4km to the south of the proposed development area (Newman RM 1996, 103). The 40kg hoard, dated to *c* AD 905, comprised 75% hack silver together with over 7250 coins, many minted in York (*ibid*; Newman 2006, 111). It has been suggested that the hoard, located so close to the Ribble, may have represented funds being gathered to fund a reinvasion of Ireland, following the expulsion of the Norsemen in AD 902 from the settlements they had founded (*op cit*, 112). Preston, which lies immediately to the south-west of the proposed development area, seems to have been the focus of activity prior to the Norman Conquest and its name derives from the Old English *Preosta* and *Tun*, meaning 'the priest's homestead' (Lancashire County Council 2006a, 18). It is suggested (*ibid*) that the archbishop of York may have established a church at Preston as early as the tenth century, following King Aethelstan's gift of land to St Peter's church, York, dated *c* 930 (Fishwick 1900, 10).
- 1.3.6 **Medieval Period:** Preston is mentioned in Domesday Book and, in 1086, is listed first among the former holdings in Amounderness of Tostig (Faull and Stinson 1986), the treacherous pre-Conquest Earl of Northumbria. At the time of the Domesday survey, the Hundred was registered as part of Yorkshire, a legacy of its Northumbrian heritage. Subsequently, William the Conqueror bestowed the territory upon Roger de Poitou. Domesday records that the manor of Preston had 52 vills, but none of these appear to have generated any revenue worth mentioning and, indeed, only 16 are recorded as being inhabited; this impoverishment is traditionally ascribed to William I's 'Harrying of the North' in 1069/70. Preston remained the dominant urban centre during the medieval period, becoming a chartered town by the thirteenth century (White 1996, 129).
- 1.3.7 The development site was located within the township of Fulwood, in the parish of Lancaster (Farrer and Brownbill 1912). The compound place-name *ful(e)-wude*, which first appears in a twelfth-century document, preserves the Anglo-Saxon elements *fūl*, meaning marshy or foul, and *wudu*, literally wood (Ekwall 1922, 148). For much of the later medieval period, Fulwood was a royal forest within the Honour Lancaster. Though originally extending further, Watling Street formed its southern extent by the thirteenth century (Hunt 2003, 34-5). In the Norman period, Crown hunting rights in royal forests were formalised, but from the early thirteenth-century reign of King John (1199-1216) successive medieval rulers granted common rights of pasturage and the right to collect wood for fuel and timber within the forest (Fishwick 1900, 18-

9; Hunt 2003, 34-5). This led to the gradual clearance of the woodland and, by 1346, there were nine farmsteads within the boundaries of the forest (Hunt 1992). In 1253 King Henry III also granted 324ha of moorland to the burgesses of Preston (*ibid*).

1.3.8 Although the township of Houghton, just to the north, is recorded in Domesday as being a single ploughland in 1066 (Farrer and Brownbill 1912), “there is little evidence for the nature and morphology of Lancashire’s rural settlement before the thirteenth century” (Newman R 1996a, 114-116). From this date, it would appear that settlement to the north-west, within the lowlands of Amounderness, tended to be more nucleated, whilst upland settlement remained dispersed. Geographically, the area immediately surrounding the site is typical of the interface between the upland and lowland zones in Lancashire, and it seems likely that the scattering of small hamlets, such as Fulwood, and individual farmsteads shown on the earliest maps is reflective of a much more ancient settlement pattern (Hunt 1992). The landscape around the site is characterised as an area of ancient enclosure, which denotes field systems datable to before AD 1600 (Ede and Darlington 2002, 97), with access tracks across the moor linking the farms and enclosed fields to the roads (Hunt 1992). Some indication of the date of the ancient enclosure is suggested by an indenture of 1329, which granted to Sir Richard de Hoghton the right to enclose all the moors, woods, marshes and mosses in the neighbouring township of Grimsargh (Hindle 1992).

1.3.9 These irregular ancient enclosure fields can be seen to the north and east of the development site, which would appear to be on the edge of the remains of an open field system farmed from the shrunken medieval settlement of Fulwood Row, to the north of the site (Welsh 1992). This single-row settlement seems to have grown up without any marked degree of regularity on a local by-way (Welsh 1992; Higham 2004, 129), with its open fields to the east and ancient enclosures, to the west, perhaps denoting former common land or moss (mario.lancashire.gov.uk; Ordnance Survey (OS) 1849). The characteristic sigmoid shape of the former cultivation strips of the open fields can be seen fossilised in the ancient enclosures and are usually thought to represent ploughing with a team of oxen, the traditional method, as seen in the fourteenth-century Luttrell Psalter for instance, rather than typically post-medieval horse traction (Backhouse 2000, 16-18). These aratral earthworks are particularly prevalent to the north and south of the east/west-aligned lanes emanating from Fulwood Row.

1.3.10 **Post-medieval period:** the volume of accessible historical data for the wider region increases steadily throughout the post-medieval period. For the early part of the period, it is likely that the character of rural settlement in the area changed little from that of the Middle Ages. From the later eighteenth century, however, development of the land would have been influenced by the tide of industrialisation that led to the expansion of Preston and its satellites. Textiles formed an important part of the local economy in the Preston area. The town had become a principal corn-milling centre by the late eighteenth century (Hunt 2003, 36-7) but, by the mid-nineteenth century, was a centre for cotton production, with 75 textile mills having been constructed in the vicinity.

Powered spinning mills had been built first in Preston from 1777 (*ibid*) although, as they pre-dated the widespread introduction of mechanical looms (Jones 1996, 233), hand-weaving remained a valued and skilled occupation within the town and its hinterland. The textile industry was not restricted to cotton, and it is likely that many of the eighteenth-century farmsteads in the landscape surrounding the proposed development area were involved with traditional home-based weaving of indigenous wool and linen (Hunt 2003, 36–7; CAP 2006, 4). By 1856, however, powered looms were in use at 60 out of the 75 textile mills within Preston (LCC 2006b, 29) and this will inevitably have had an impact on the demand for home-based weaving in the rural areas surrounding the town.

- 1.3.11 The landscape surrounding the development site in this period remained predominantly rural, incorporating elements of the older medieval field systems fossilised as strip-fields, which can be seen emanating from the east of Fulwood Row, either side of two east/west-aligned tracks. Aerial photographs taken in the 1960s (mario.lancashire.gov.uk), suggest that the medieval field systems provided the framework for post-medieval agriculture and enclosure. Around the site, ridge and furrow is clearly apparent within the narrow, straighter strip fields, likely to date from the eighteenth or nineteenth century (Higham 2004, 58, 65), when the moor was finally subjected to the Enclosure Act. Those who benefitted from the enclosure of the common land were responsible for demarcating it with hedges and fences (Hunt 1992).
- 1.3.12 The 1849 OS map shows many pits or ponds in the surrounding fields, likely to be marl pits dug to extract clay which, when mixed with lime, was spread on fields as a way of controlling acidity, improving the moisture content and texture of the soil. Such practices were common in various parts of England in the eighteenth and early nineteenth century and are indicators of arable crops (Newman and McNeil 2007, 119; Harvey 1984, 67-68). However, given that the drift geology of the area was clay, this would have proved a costly way of improving the land (*ibid*), and the practice declined in the later nineteenth century.

2. METHODOLOGY

2.1 □ INTRODUCTION

- 2.1.1 Following the issue of a verbal brief by LCAS, a method statement (*Appendix I*) was submitted to the client by OA North. The method statement was adhered to in full, and the work was consistent with the relevant Institute for Archaeologists (IfA) and English Heritage guidelines (IfA 2008a, 2008b, 2011; English Heritage 2006).

2.2 □ EVALUATION TRENCHING

- 2.2.1 The topsoil was removed by machine (fitted with a 1.8m toothless ditching bucket) under archaeological supervision to the surface of the first significant archaeological deposit. This deposit was cleaned by hand, using either hoes, shovel scraping, and/or trowels depending on the subsoil conditions, and inspected for archaeological features. All features of archaeological interest were investigated and recorded.
- 2.2.2 All trenches were excavated in a stratigraphical manner. Trenches were located by use of a differential Global Positioning System (dGPS), and altitude information has been established with respect to Ordnance Survey Datum.
- 2.2.3 All information identified in the course of the site works was recorded stratigraphically, using a system adapted from that used by the former Centre for Archaeology of English Heritage, with an accompanying pictorial record (plans, sections, and monochrome contacts/digital photographs). Primary records were available for inspection at all times.
- 2.2.4 Results of all field investigations were recorded on *pro forma* context sheets. The site archive includes both a photographic record and accurate large-scale plans and sections at an appropriate scale (1:50, 1:20 and 1:10). All artefacts were recorded using the same system, and will be handled and stored according to standard practice (following current Institute for Archaeologists guidelines).

2.3 □ FINDS

- 2.3.1 The recovery of finds and sampling programmes were carried out in accordance with best practice (following current IfA guidelines 2008b), and subject to expert advice in order to minimise deterioration. All artefacts recovered from the evaluation trenches were retained.

2.4 □ PALAEOENVIRONMENTAL SAMPLING AND ASSESSMENT

- 2.4.1 A targeted programme of palaeoenvironmental sampling was implemented in accordance with the Oxford Archaeology *Environmental Guidelines and Manual* (OA 2005), and in line with the English Heritage guidance paper on

Environmental Archaeology (2001). In general, one bulk sample was taken where appropriate, to be sub-sampled at a later stage.

- 2.4.2 During processing, between ten and forty litres of bulk sample was hand-floated where the flots were collected on a 250 micron mesh and air-dried. The heavy residues were sorted and any plant remains, or charcoal fragments over 4mm in size were extracted. The flot and sorted material was examined using a Leica MZ60 stereo microscope at up to x40 magnification. Any plant remains were provisionally identified and quantified on a scale of +-++++, where '+' is less than five items and '++++' is more than 100. Identification was aided by comparison with the modern reference collection held at OA North.
- 2.4.3 Preliminary identification of the charcoal was also carried out and identifications were made with reference to standard texts (Cappers *et al* 2006; Hather 2000) and a small reference collection. Classification and nomenclature follow Stace (1997) and Hather (2000). The components of the matrix, such as modern roots, insect remains, bone, coal and heat affected vesicular material (hvm) were also quantified. The suitability of the samples for further analysis and scientific dating was also noted and presented in the *Appendix 5*.

2.5 ARCHIVE

- 2.5.1 A full professional archive has been compiled in accordance with the method statement (*Appendix 1*), and in accordance with current IfA and English Heritage guidelines (English Heritage 2006). The paper and digital archive will be deposited in the County Records Office, Preston on completion of the project. The material archive is to be deposited with the Museum of Lancashire.

3. FIELDWORK RESULTS

3.1 INTRODUCTION

3.1.1 In total, nine trenches were excavated during the course of the investigations (Fig 2), with five targeting potential archaeological features identified in the geophysical survey (*Appendix 2*; Trenches 4, 5, 7-9), and the remaining four to sample those areas with no significant geophysical results or those areas not surveyed. The presence of a water main running north-east/south-west across the site prevented the area around it from being excavated (Fig 2). Eight of the trenches were 30m in length, with Trench 4 measuring 60m, and all were 2m wide. A summary of the results for each area is presented below, with a context list provided in *Appendix 3* and the finds catalogued in *Appendix 4*.

3.2 RESULTS

3.2.1 **Trench 1** (Fig 3): was located to the west of the site on a roughly north/south alignment, and was excavated to a maximum depth of 0.57m. This was an area that had not been subject to the geophysical survey and, consequently, the trench was positioned to generally sample the area. The natural boulder clay **102** was cut by four gullies. At the southern end of the trench, curvilinear drainage gully **104** traversed the trench from east to west, and was 0.4m wide and 0.1m deep. The single fill, **105**, had a high proportion of stones towards the base of the deposit, indicating that the feature had silted up naturally. To the north of gully **104**, another gully of similar proportions was observed, curvilinear gully **108**, which also ran east/west across the trench and was 0.35m wide and 0.06m deep. A similar fill, **109**, was observed and included rounded stones towards the base of the deposit. From the curve of the two features, and the similarity in the fills, it could be supposed that they were two sides of a circular gully with an extrapolated circumference of 10m (Plate 1).

3.2.2 Several discrete features were observed and investigated but were proved to be bioturbation. These features were sealed by a dark brown clay-silt subsoil **101**, which was 0.13m thick. Cut into the subsoil were two further gullies. At the north of the trench a north-west/south-east aligned gully, **110**, was 0.35m wide and 0.34m deep. The profile of the gully was an irregular V-shape, and the fill, **111**, appeared to be formed from the subsoil falling back into the cut shortly after it was made, leading to the interpretation of a plough scar. A small fragment of post-medieval pottery was recovered from fill **111**. At the south of the trench was very straight narrow gully **106**. With a V-shaped profile, 0.08m wide and 0.12m deep, and a single fill comprising subsoil **107**, a tentative interpretation of a plough scar has also been made. The final deposit within the trench was topsoil **100**, a dark brown clay-silt, 0.25m thick.



Plate 1: North-facing view of Trench 1 with gullies **104** and **106**, which possibly form a circular feature, to the north of the scale bars

- 3.2.3 **Trench 2** (Fig 2): was positioned to the north of the site and was within an area which had yielded poor results in the geophysical survey due to the magnetic disturbance from the water main. The trench was on a roughly north/south alignment, and was excavated to a maximum depth of 0.52m. The natural mottled orange/brown and greyish-blue silty-clay, **200**, was cut by one field drain and was disturbed by an area of bioturbation, and was sealed by dark brown clay-silt topsoil **201** (0.3m thick). No archaeological remains were observed.
- 3.2.4 **Trench 3** (Fig 3): was on a roughly north/south alignment and was excavated to a maximum depth of 0.42m. As with Trench 2, this trench was in an area where the water main had disrupted the results of the geophysical survey. The natural yellowish-brown sandy-clay **302** was cut by a short curvilinear gully, **303** (Plate 2). Positioned entirely within the trench boundary, the S-shaped gully was 4.5m long, 0.5m wide and 0.2m deep. The feature was backfilled with fill **303**, which had no finds. The purpose of the gully remained enigmatic. The feature was sealed by dark brownish-grey clay-silt subsoil **301** (0.15m thick), and dark brownish humic silt topsoil **300** (0.3m thick).



Plate 2: South-east-facing view of S-shaped gully **304** in Trench 3

- 3.2.5 **Trench 4** (Fig 4): was positioned on a roughly east/west alignment, across a linear geophysical anomaly interpreted as a probable bank or earthwork of archaeological origin. The trench position also took into consideration areas of possible hard or compacted ground. The trench was excavated to the mottled blueish-grey boulder clay natural **403**, at a depth of 0.4m, and two ditches and three gullies were observed.
- 3.2.6 The earliest feature within the trench was north-east/south-west-aligned gully **417** (0.75m wide, 0.2m deep; Fig 5; Plate 3), which had silted-up with a dark organic deposit (**416**). Ditch **404** (Fig 5; plate 3) ran parallel to, and truncated, gully **417**, and corresponded with the geophysical anomaly. It was 3.3m wide, 0.5m deep, with an irregular profile; a deposit indicative of silting (fill **415**), appears to have been recut as ditch **404**, which was rapidly backfilled with a mixed deposit, including a high proportion of lumps of redeposited natural clay (fill **403**). Ditch **409** (Fig 5) was located to the west of ditch **404**, and ran on a north-west/south-east alignment forming a right angle with **404** (although the relationship was situated outside the trench confines to the south). The similar dimensions to ditch **404** (2.7m wide, 0.5m deep) cut into the similar deposits of silting of earlier ditches (fills **406** and **407**), followed by deliberate backfill (fill **405**) suggest contemporaneity.



Plate 3: South-west-facing view of section through ditch **404** and gully **417** in Trench 4

- 3.2.7 Within the angle of the two large ditches, two smaller shallow gullies were recorded. Gully **411** was 0.2m wide and 0.05m deep, and was on a north-east/south-west alignment and was filled with a water-borne silty deposit (**410**). Gully **414** (0.4m wide, 0.1m deep) was on a north-west/south-east alignment, and had silted-up with deposits **412** and **413**. The drainage gullies appeared to be contemporary with each other and flowed into the larger boundary ditches **404** and **409**. These features were sealed by a dark greyish-brown humic silt subsoil **401** (0.1m thick), and topsoil **400** (0.3m thick).
- 3.2.8 **Trench 5** (Fig 6): was on a north-west/south-east-alignment and targeted the same linear geophysical anomalies as Trench 4 to the east. The trench was excavated to a maximum depth of 0.42m to the level of the sandy-clay natural geology, **502**. One ditch was observed, which corresponded to the ditch and bank anomaly. East/west-aligned ditch **503** (2.45m wide, 0.4m deep; Fig 7) had a wide U-shaped profile, and had initially started to silt-up naturally (fill **504**), but had then been recut on two possible occasions (fills **505** and **507**). The ditch was sealed by dark brown silty-clay subsoil **501** (0.02m thick), and topsoil **500** (0.28m thick).
- 3.2.9 **Trench 6** (Fig 2): was within an area in which no geophysical anomalies were identified. The trench was on a north-north-east/south-south-west alignment, and was excavated to a maximum depth of 0.45m. The natural sandy-silty-clay, **601** was overlain by topsoil **600** (0.3m thick). No archaeological remains were observed.

- 3.2.10 **Trench 7:** targeted anomalies identified from the electrical resistance survey as various areas of potentially compacted ground, and was on a north-east/south-west alignment (Fig 6). The geophysical survey results were explained by localised patches of compacted sandy-clay natural geology **701**, which had a high proportion of degraded sandstone and gravel observed at 0.35m below ground level. This was cut by north-north-west/south-south-east-aligned ditch **702** (1.1m wide, 0.45m deep; Fig 7; Plate 4). The ditch had a U-shaped profile and appeared to have silted up naturally with a number of deposits. This was overlain by topsoil **700** (0.21m thick).



Plate 4: North-facing view of ditch **702** in Trench 7

- 3.2.11 **Trench 8:** was on a north-west/south-east alignment, and again targeted areas of compacted ground (Fig 2) identified from the survey results. The natural geology was a soft clay-silt **801**, which had the appearance of having been boggy ground or waterlogged. During machine excavation, it frequently pulled away to reveal a compacted natural sandy lens beneath. This was overlain by topsoil **800** (0.3m thick). No archaeological remains were observed.
- 3.2.12 **Trench 9:** was on a north-west/south-east alignment, and was excavated to a depth of 0.4m (Fig 2). The natural geology at the south-east end of the trench was compacted silty-gravel-clay **901**, and towards the north-west end was **902**, a light blueish-brown silty-clay. This change between the two deposits corresponds with the probable compacted ground shown in the geophysical survey. There were two irregular features, which, on investigation, were identified as shallow bioturbation. The final deposit in the trench was topsoil **900** (0.3m thick).

3.3 FINDS

- 3.3.1 In all, seven fragments of artefacts were recovered during the investigation. Their distribution is shown below (Table 1). All were very small and abraded and, as a result, say little about any specific activity on the site, although in all cases, the pottery suggests that there was activity in the late nineteenth to early twentieth century.

Context Number	Pottery	Ceramic Building Material	Total
111	1	-	1
402	2	-	2
405	1	1	2
504	1	1	2
Totals	5	2	7

Table 1: Distribution of artefacts by context

3.4 PALAEOENVIRONMENTAL ASSESSMENT

- 3.4.1 *Quantification*: eleven bulk samples taken during excavation of the site were processed for the assessment of waterlogged plant remains (WPR), charred plant remains (CPR), mineralised plant remains and charcoal. The samples came from a series of boundary ditches and associated drainage gullies, probably post-medieval in date. One short gully (**106**) was interpreted as a possible plough scar. The sampled fills consist of deposits that were likely to have been naturally deposited. The aim of the assessment was to quantify and provisionally identify any surviving environmental material in the features in terms of providing information on any nearby economic/cultural practices and on the nature of the local environment.
- 3.4.2 *Assessment results*: two of the features, gully **108** and ditch **404**, contained rare CPR, including *Corylus* (hazel) nut fragments and a possible tuber fragment in **108**, and Cyperaceae stem fragments in **404**. The remaining nine features were devoid of CPR. All eleven features contained rare to abundant charcoal fragments. The most charcoal-rich fills were from gullies **108** and **304**, and ditch **404**, however many of the fragments were poorly-preserved and infused with sediment. The better-preserved fragments were identified as *Quercus* sp (oak) and cf *Alnus/Corylus* (alder/hazel), plus some samples contained other diffuse porous charcoal, which was not easily identifiable to species or type.
- 3.4.3 Waterlogged plant remains were recorded in nine of the features, however in most cases, these amounted to no more than 25 seeds. Common to abundant seeds were recorded in gully **104** and ditch **702** in which one type of taxon was predominant and species diversity was low. Seeds of plants of damp/wet ground, such as *Juncus* sp (rushes) and Cyperaceae (sedges) were consistently recorded, as was *Rubus fruticosus* L. agg. (brambles), common in areas of scrub or in hedgerows. Seeds of *Euphorbia* cf *helioscopia* (sun spurge) were identified, their presence indicating cultivated or waste ground. *Lamium* sp (dead-nettles) and *Viola* sp (violets) seeds were also recorded, however these

genera include species that grow in a wide range of habitats. Although it is possible some of the waterlogged seeds are modern, the high level of organic material in fill **703**, from ditch **702** suggests that the site, in the area of Trench 7 at least, was prone to wet conditions, which is conducive to preservation through waterlogging.

- 3.4.4 Most of the fills contained rare to frequent insect or insect egg fragments, coal and havm. Three, from ditches **404** and **702**, contained rare to frequent wood fragments.
- 3.4.5 *Potential:* the assessment of the bulk samples indicates a general paucity of charred plant remains and the presence of poorly-preserved charcoal. Waterlogged seeds are reasonably well-preserved, although species diversity is low. Further work would not add significantly to the current study, therefore there are no recommendations for full analyses.

4. CONCLUSION

4.1 DISCUSSION

- 4.1.1 The main feature observed in the evaluation trenching was the linear cut feature identified in the geophysical survey and visible on aerial photographs (Plate 5). This ditch was excavated in Trenches 4 and 5 (**404** and **503**), and was consistent in form and fills, and most likely represented the field boundary seen on the First Edition OS map of 1849. However, by the OS map of 1893 (GVA Grimley 2006) it had been backfilled and straightened to the form of the existing boundary. There was no firm evidence for the bank or earthwork that had been detected in the survey results, suggesting that perhaps it had been used to backfill the ditch, and the ploughed-out remnants were not distinguishable from the topsoil. Ditch **409**, which appeared to be a contemporary internal division within the field boundary ditch, defined broadly an area which was labelled possible compacted ground in the geophysical survey. Although ditch **404/503** was visible on the 1849 OS map, internal ditch **409** was not, leading to queries about the date of this feature. A second boundary ditch, **702**, was also not present on the 1849 OS map, but again from the fills and the small amount of post-medieval pottery retrieved, would suggest a similar date to the main boundary ditch **404/503**. The palaeoenvironmental data collected from the ditches confirmed the presence of waterlogged remains, consistent with a wet environment.



Plate 5: Aerial photograph showing cropmark of field boundary **404/503** extant on OS map of 1849

- 4.1.2 Trenches 1 and 3 were positioned to sample an area not surveyed with geophysics and an area with no geophysical anomalies respectively. At the northern end of Trench 3 an enigmatic curvilinear undated gully-type feature (**304**) was observed. The possible circular feature in Trench 1 (**104** and **108**) was also undated and its function unknown. There was no evidence found to date these features and it is possible that they were agricultural in origin. However, the curvilinear feature in Trench 1 may also be of archaeological origin.
- 4.1.3 The remaining geophysical anomalies targeted during the trial trenching, that were generally classified as compacted ground, appeared to be changes in the natural geology, which varied greatly in compaction and consistency, particularly in the southernmost trenches.

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6. ILLUSTRATIONS

6.1 □ FIGURES

Figure 1: Site Location Map

Figure 2: Trench Locations

Figure 3: Plan of Trench 1 and 3

Figure 4: Plan of Trench 4

Figure 5: Sections through ditches **404**, **417** and **409**, Trench 4

Figure 6: Plan of Trench 5 and 7

Figure 7: Sections through ditches **503** (Trench 5) and **702** (Trench 7)

6.2 □ PLATES

Plate 1: North-facing view of Trench 1 with gullies **104** and **106**, which possibly form a circular feature, to the north of the scale bars

Plate 2: South-east-facing view of S-shaped gully **304** in Trench 3

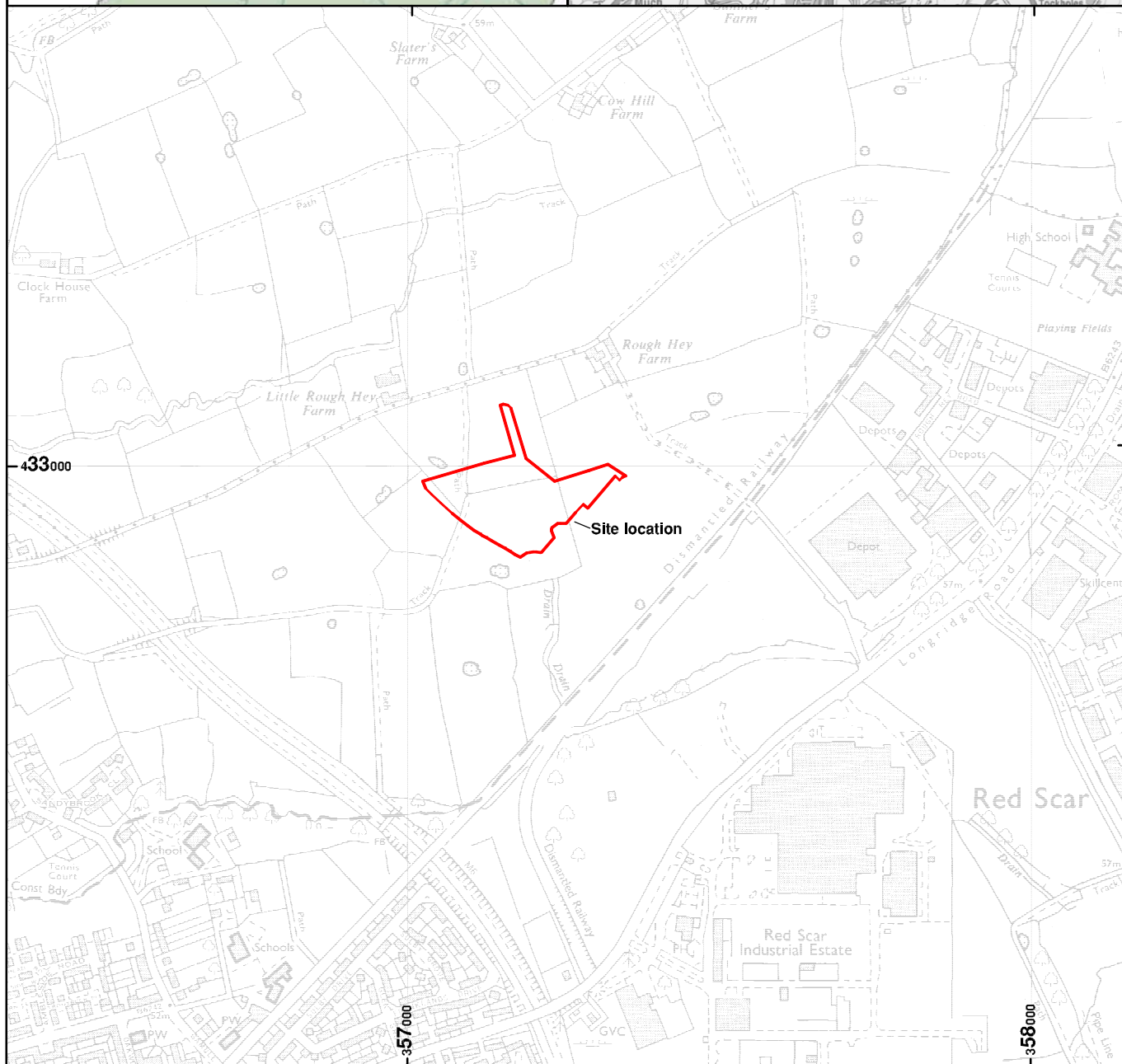
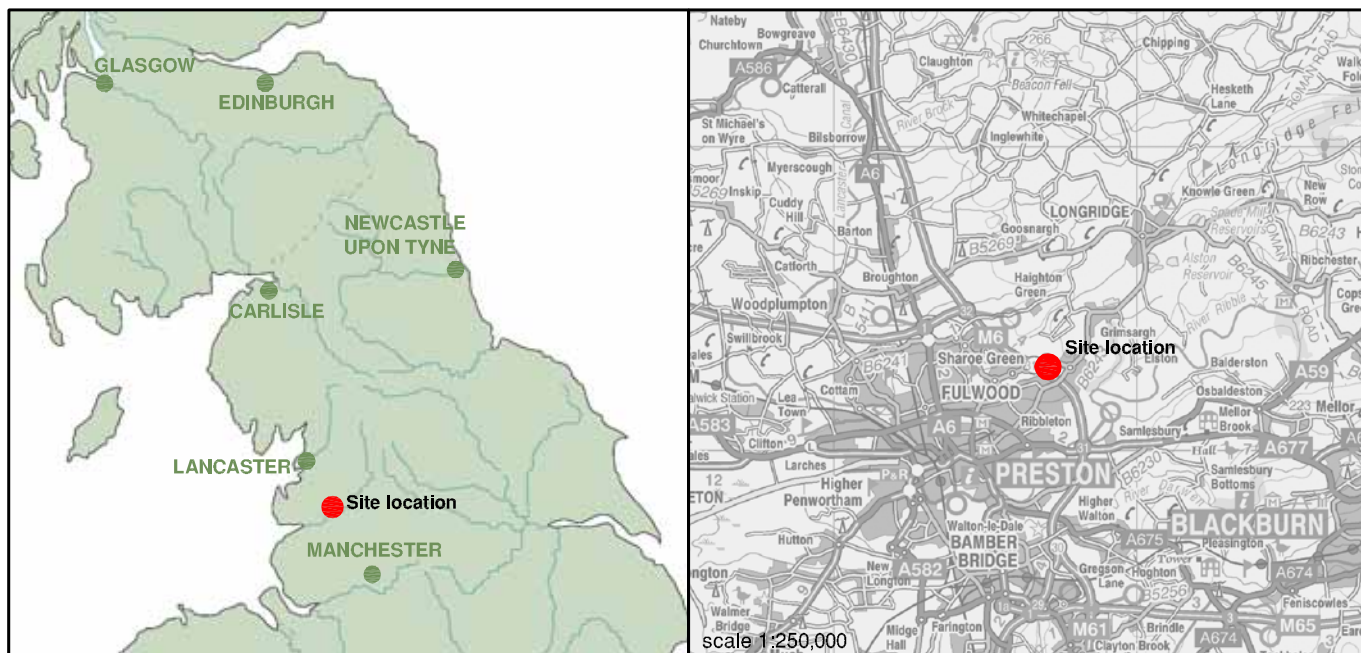
Plate 3: South-west-facing view of section through ditch **404** and gully **417** in Trench 4

Plate 4: North-facing view of ditch **702** in Trench 7

Plate 5: Aerial photograph showing cropmark of field boundary **404/503** extant on OS map of 1849

6.3 □ TABLES

Table 1: Distribution of artefacts by context



Based upon the Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office ©Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Oxford Archaeology Licence No. AL 100005569 (2011).

0 250 m
1:10,000 @ A4



Figure 1: Site location

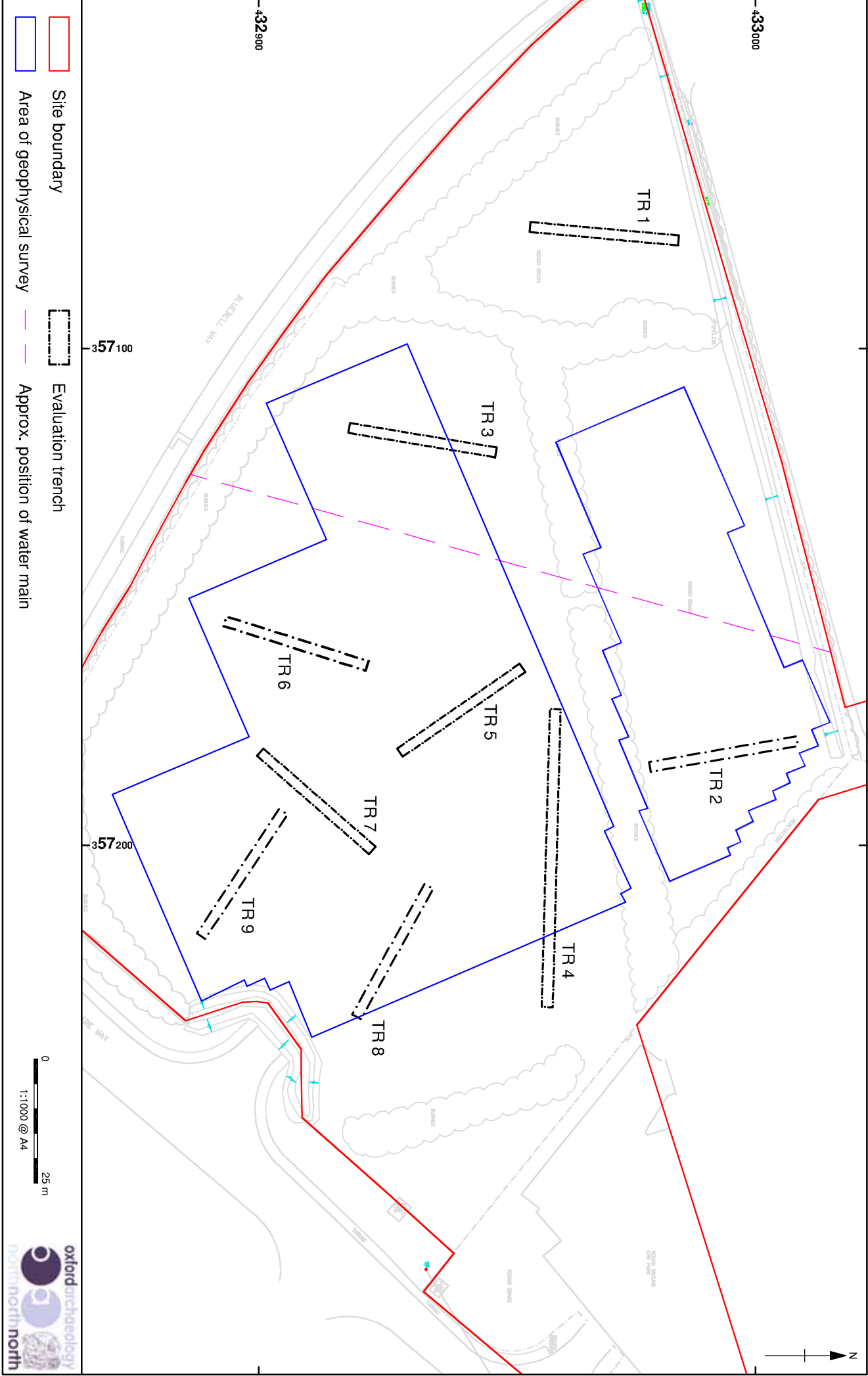


Figure 2: Trench Locations

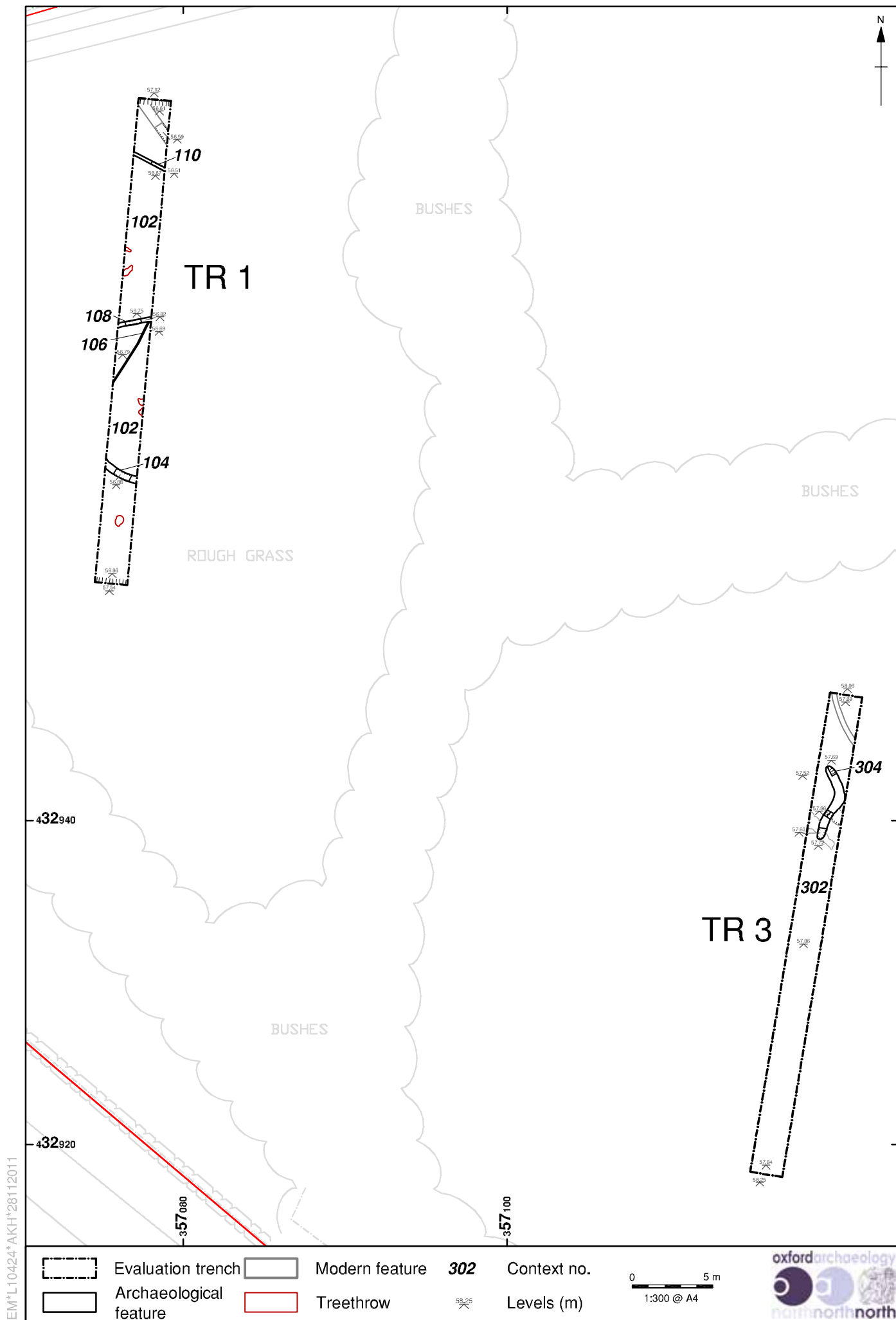


Figure 3: Plan of Trenches 1 and 3

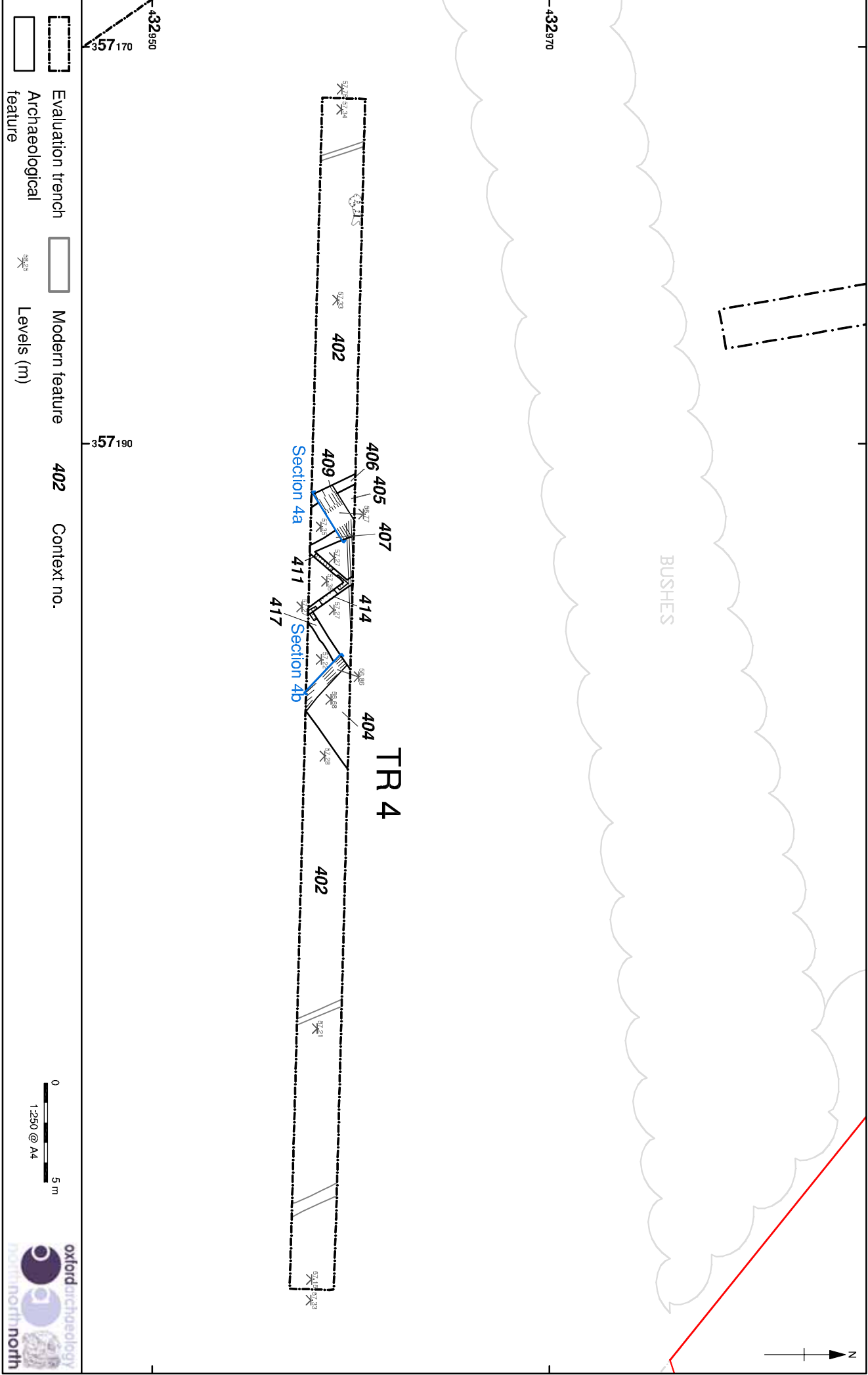


Figure 4: Plan of Trench 4

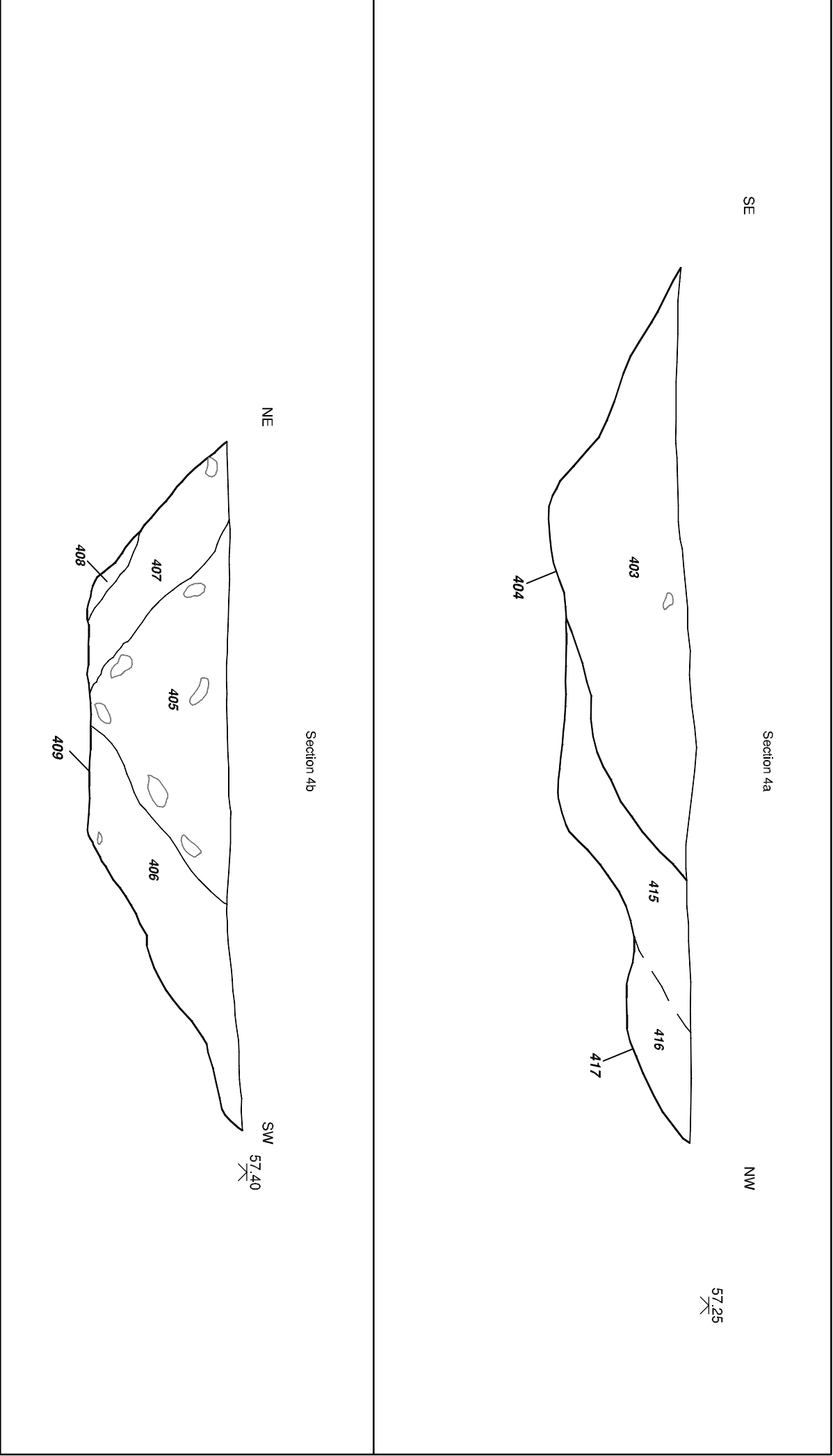


Figure 5: Sections through ditches **404**, **417** and **409** (Trench 4)

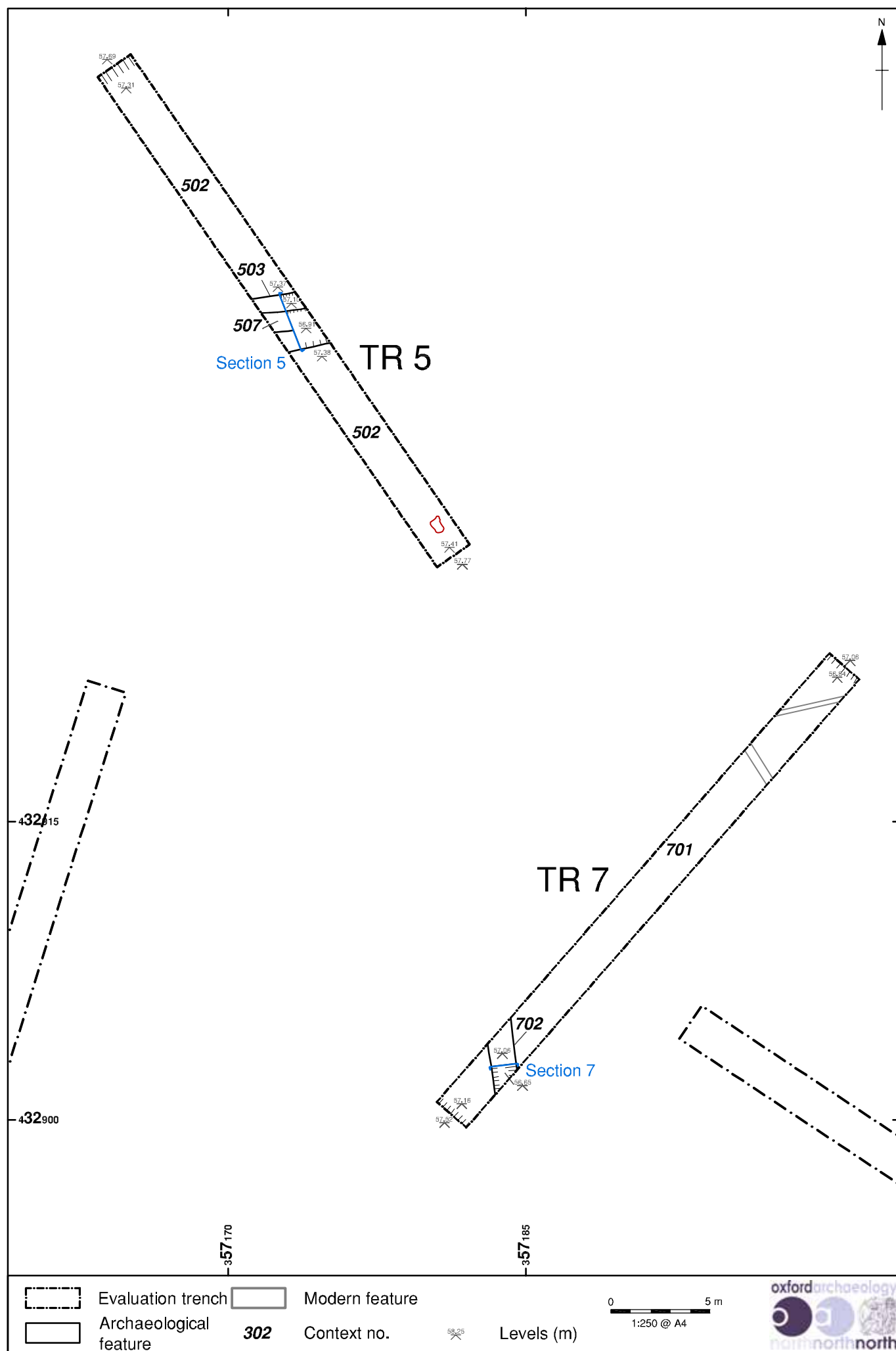


Figure 6: Plan of Trenches 5 and 7

Figure 7: Sections through ditches 503 (Trench 5) and 702 (Trench 7)

APPENDIX 1: METHOD STATEMENT

1. INTRODUCTION

1.1 ☐ PROJECT BACKGROUND

- 1.2.1 The following is a statement detailing the activities that will take part to evaluate the archaeological potential of 2.42ha of land off Bluebell Way, Preston East, Lancashire. Following an Environmental Impact Assessment carried out to accompany the planning application for the site, a programme of evaluation was agreed with the Lancashire County Archaeology Service (LCAS), specifically to undertake a geophysical survey and subsequent targeted trial trenching to understand the potential impact of the proposed development on the cultural heritage resource. This archaeological investigation is the first stage in an iterative process, whereby the aim is to identify any requirements for mitigation prior to or during construction, which is beyond the present scope and will be dealt with separately.

2. METHOD STATEMENT

2.1 ☐ STAGE 1: ARCHAEOLOGICAL GEOPHYSICAL SURVEY

- 2.1.1 **Magnetometry:** a magnetic, or magnetometer, survey is usually the first choice for a geophysical survey owing to its ability to be carried out relatively quickly, and efficiently (English Heritage 2008). Magnetometry will easily locate 'positively magnetic' material, such as iron-based features and objects, or those subjected to firing such as kilns, hearths, and even the buried remains of brick walls. Therefore, this technique is suitable in the detection of features associated with industrial activity. This technique can also be widely used to locate the more subtle magnetic features associated with settlement and funerary remains, such as boundary or enclosure ditches, and pits or postholes, which have been gradually infilled with more humic material. The breakdown of organic matter through microbiotic activity leads to the humic material becoming rich in magnetic iron oxides when compared with the subsoil, allowing the features to be identified. Conversely, earthwork or embankment remains can also be identified with magnetometry as a 'negative' feature due to the action in creating the earthwork of upturning the relatively low magnetic subsoil on to the more magnetic topsoil. This technique is classed as a *passive* technique as it relies on measuring the physical attributes, or the magnetic field, of features that exist in the absence of a measuring device, such as a kiln or ferrous object (Schmidt 2001, 6).
- 2.1.2 However, the main drawback to magnetic surveys is that non-thermoremanent features, such as stone building remains, or those features with magnetic susceptibility levels similar to those of the background (particularly in areas where the parent material of the topsoil has very low magnetic susceptibility levels) will fail to be seen in the magnetic survey results.
- 2.1.3 **Methodology:** the survey will be 0.97ha in total (40% of the total development site), and will be divided into areas (further subdivided into 30m x 30m survey grids) suitable for survey, i.e. a good representative sample in areas away from magnetic disturbance (e.g. fence boundaries, rubble). This will be undertaken using a fluxgate gradiometer or equivalent geomagnetic sensor and an appropriate data-logger over the survey grids accurately tied in to the National Grid and/or to local features. The surveyors, each carrying an instrument, will scan the ground logging magnetic readings every 0.25m along parallel traverses spaced a 1m apart within each 30m grid square. The instrument is held above ground from which data are captured in the internal memory, and then downloaded to a portable computer for processing.
- 2.1.4 **Electrical Resistance Survey:** non-magnetic stone structures or megaliths cannot be easily identified with magnetometry. Therefore, stone building remains may be difficult to identify or interpret without the use of electrical resistivity. Therefore, although this is a much slower technique than magnetometry it is complementary in its application. An area of 0.36ha will be surveyed subsequent to the magnetometry over features identified in the magnetometry results that offer potential, to investigate their origins further.
- 2.1.5 Electrical resistivity is classed as an *active* technique as it requires physically injecting a current into the ground and measuring the response (*ibid*). An earth resistance meter relies on

the properties of the moisture retained within the soil to pass an electrical current through the ground from a pair of mobile probes, mounted on a frame (similar in appearance to a 'Zimmer' frame), to a pair of remote probes. The resistance is measured between the probes and can identify buried remains when compared to the background resistance. Cut features that have been subsequently infilled tend to be more moisture retentive and thereby less resistant to the current. These features manifest as low resistance anomalies. Structural remains or buried megaliths are more resistant to the current flow and are seen as high resistance features.

- 2.1.6 **Methodology:** the standard methodology for an electrical resistance survey is to have the two mobile probes mounted horizontally on a frame at a distance of 0.5m apart, and a data-logger. These probes literally make contact with the ground and will produce a depth of current penetration of approximately 0.5m-1.0m. The data are captured in the internal memory and then downloaded to a portable computer. The survey area will be divided into the same 30m grid system also used for the magnetometer survey.
- 2.1.7 The survey operator will walk along transects 1m apart, taking readings at 1.0m intervals. As with the magnetometer survey, the survey grid will be accurately tied in to the National Grid and/or to local features by instrument survey.
- 2.1.8 **Data Download and Processing:** data from the survey will be downloaded from the data-logger into a lap top or field computer at appropriate intervals (minimum daily), to ensure security of the data. Data will be processed to maximise the clarity of the archaeological data, including, as appropriate, the removal of striping or other survey artefacts, random 'spikes', drift in machine calibration and the minimisation of background 'noise' or other natural or modern features which tend to obscure archaeological anomalies.

2.2 □ STAGE 2: ARCHAEOLOGICAL TRENCHING

- 2.2.1 The programme of trial trenching will target features identified from the results of the geophysical survey, and will also aim to sample 5% the whole area. This will establish the presence or absence of any previously unsuspected archaeological deposits. Once established, the trial trenches will enable the date, nature, depth and quality of preservation of the remains, and establish the requirements for any further mitigation work.
- 2.2.2 **Trenches:** in consultation with LCAS a maximum 5% sample of the area will be trenched, which equates to 20 trenches each 30m long by 2m wide. Of the 20, four would be held in reserve as a contingency to focus on areas of archaeological remains should these be identified. Dependent on the results of the geophysical survey, the scope of the trenching could be reduced.. A plan showing the proposed location of trenches will be produced within one week of the completion of the survey for approval by LCAS prior to the commencement of the fieldwork.
- 2.2.3 Trenches will be located by use of GPS equipment which is accurate to +/- 0.25m, or using an EDM Total Station, based on a site grid related to the National Grid obtained from client base mapping. Altitude information will be established with respect to Ordnance Survey Datum.
- 2.2.4 **Methodology:** topsoil and modern overburden will be removed by a 13-ton tracked 360 machine (fitted with a toothless ditching bucket) in each trench, under archaeological supervision. This will proceed in shallow, equal spits down to the surface of the first significant archaeological deposit, or natural deposit, whichever is encountered first. This deposit will then be cleaned by hand, using either hoes, shovel scraping, and/or trowels depending on the subsoil conditions, and inspected for archaeological features. All features of archaeological interest will then be investigated and recorded unless otherwise agreed by LCAS.
- 2.2.5 All trenches will be excavated in a stratigraphical manner, whether by machine or by hand. They will not be excavated deeper than 1-1.2m to accommodate earth and safety constraints, without shoring or stepping out of the trench sides.

- 2.2.6 Any investigation of intact archaeological deposits will be exclusively manual. Selected pits and postholes will normally only be half-sectioned, linear features will be subject to no more than a 10% sample, and extensive layers will, where possible, be sampled by partial rather than complete removal. All excavation, whether by machine or by hand, will be undertaken with a view to avoiding damage to any archaeological features, which appear worthy of preservation *in situ*. These features will then be dealt with during the mitigation stage if required.
- 2.2.7 **Human Remains:** any human remains uncovered will be left *in situ*, covered and protected. No further investigation will continue beyond that required to establish the date and character of the burial. LCAS, the Environmental Health Officer and the local Coroner will be informed immediately. If removal is essential the exhumation of any funerary remains will require the provision of a Home Office license, under section 25 of the Burial Act of 1857. An application will be made by OA North for the study area on discovery of any such remains and the removal will be carried out with due care and sensitivity under the environmental health regulations.
- 2.2.8 **Treatment of finds:** all finds will be exposed, lifted, cleaned, conserved, marked, bagged and boxed in accordance with the United Kingdom Institute for Conservation (UKIC) *First Aid For Finds*, 1998 (new edition) and the recipient museum's guidelines, in this case the Museum of Lancashire. All identified finds and artefacts will be retained, although certain classes of building material can sometimes be discarded after recording if an appropriate sample is retained on advice from the recipient museum's archive curator.
- 2.2.9 **Treasure:** any gold and silver artefacts recovered during the course of the excavation will be removed to a safe place and reported to the local Coroner according to the procedures relating to the Treasure Act, 1996. Where removal cannot take place on the same working day as discovery, suitable security will be employed to protect the finds from theft.
- 2.3 ☐ **SPOIL AND REINSTATEMENT**
- 2.3.1 The removed spoil will be stored adjacent to the trench, with the spoil separated into topsoil and subsoil. It is understood that there will be no requirement for reinstatement of the ground beyond backfilling. The ground will be backfilled so that the topsoil is laid on the top, and the ground will be roughly graded with the machine.
3. **PROGRAMME OF EVENTS**
- 3.1 ☐ **GEOPHYSICAL SURVEY**
- 3.1.1 It is anticipated that approximately two days work are required on site from 27th to 28th October 2011, and that preliminary results should be made available by Tuesday 1st November 2011.
- 3.2 ☐ **CONSULTATION WITH LCAS**
- 3.2.1 Following receipt of the survey results it is expected that the turnaround for the location plan and subsequent approval by LCAS should take one to two weeks.
- 3.3 ☐ **TRIAL TRENCHING**
- 3.3.1 The period of time required for this element is approximately two weeks, although the precise number of trenches need to be agreed with LCAS.
- 3.4 ☐ **REPORT AND ARCHIVE**
- 3.4.1 The report and archive will be produced following the completion of all the fieldwork. An interim statement can be provided within approximately two weeks following completion of the site work and the final report will be available within eight weeks of completion of the fieldwork. The archive will be deposited within six months.

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APPENDIX 2: GEOPHYSICAL SURVEY

Geophysical Survey Report

Red Scar, Preston, Lancashire

for

Oxford Archaeology North

November 2011

Job ref. J2985

Melanie Biggs BSc (Hons)



Document Title: **Geophysical Survey Report
Red Scar, Preston, Lancashire**

Client: **Oxford Archaeology North**

Stratascan Job No: **J2985**

Techniques: **Detailed gradiometry and earth resistance**

National Grid Ref: **SD 571 329**



Plate 1: Looking north west across the earth resistance target area

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Figure 1 1:25 000 General location plan

Figure 2 1:1000 Site plan showing location of grids and referencing

Figure 3 1:1000 Plot of minimally processed gradiometer data

Figure 4 1:1000 Colour plot of gradiometer data showing extreme magnetic values

Figure 5 1:1000 Abstraction and interpretation of gradiometer anomalies

Figure 6 1:1000 Plot of raw and processed earth resistance data with interpretations

Figure 7 1:1000 Combined abstraction and interpretation of gradiometer & earth resistance anomalies

1 SUMMARY OF RESULTS

A detailed gradiometry survey and targeted earth resistance survey was carried out over approximately 0.97 ha and 0.36 ha, respectively, of pasture on the eastern outskirts of Preston, Lancashire.

An area of probable archaeology has been identified in the form of a curvilinear ploughed out bank and ditch feature. There are patches of high and low resistance lying close along the length of this feature which may or may not be associated.

An area of possible archaeology has been identified in both datasets to the east of the survey area. The positive magnetic anomaly suggests a cut feature, but an overlying high resistance anomaly suggests hard compacted ground. This implies a cut and backfilled feature and may warrant further investigation to determine its origins.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by

2.2 Site location

The site is located just east of Junction 31a of the M6 near Preston at OS NGR ref. SD 571 329.

2.3 Description of site

The site lies across ~0.97ha of flat pasture land lying just east of junction 31a of the M6. The site is bounded on all sides by timber post and rail fences and hedgerows. There are thick hedges separating fields to the north and west of site. A water main runs through the survey area from the south west to the north east.

The underlying geology is sandstone of the Sherwood Sandstone group (British Geological Survey website). The drift geology is Devensian Till (Diamicton) (British Geological Survey website).

The overlying soils are Salop which are typical stagnogley soils. These consist of reddish fine and coarse loamy soils that are slowly permeable and seasonally waterlogged. (Soil Survey of England and Wales, Sheet 3 Midland and Western England).

2.4 Site history and archaeological potential

No specific details were available to Stratascan.

2.5 Survey objectives

The objective of the survey was to locate any anomalies that may be of archaeological significance prior to trenching.

2.6 Survey methods

More information regarding these techniques is included in the Methodology section below.

3 **METHODOLOGY**

3.1 Date of fieldwork

The fieldwork was carried out on Thursday 27th October 2011 when the weather was wet with light rain.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site. The baseline coordinates have been taken from the OS referenced base mapping.

3.3 Description of techniques and equipment configurations

Gradiometer

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate

to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Earth resistance

This method relies on the relative inability of soils (and objects within the soil) to conduct an electrical current which is passed through them. As earth resistance is linked to moisture content, and therefore porosity, hard dense features such as rock will give a relatively high earth resistance response, while features such as a ditch which retains moisture give a relatively low response.

The resistance meter used was an RM15 manufactured by Geoscan Research incorporating a mobile Twin Probe Array. The Twin Probes are separated by 0.5m and the associated remote probes were positioned approximately 15m outside the grid. The instrument uses an automatic data logger which permits the data to be recorded as the survey progresses for later downloading to a computer for processing and presentation.

The resistance meter was used in conjunction with an MPX15 multiplexer to allow two adjacent readings to be taken at each instrument position.

Though the values being logged are actually resistances in ohms they are directly proportional to earth resistance (ohm-metres) as the same probe configuration was used through-out.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Gradiometer

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. All traverses were surveyed in a “zigzag” mode.

Earth resistance

Readings were taken at 1.0m centres along traverses 1.0m apart. This equates to 900 sampling points in a full 30m x 30 grid. All traverses were surveyed in a “zigzag” mode.

3.4.2 Depth of scan and resolution

Gradiometer

The Grad 601 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an optimum methodology for the task balancing cost and time with resolution.

Earth resistance

The 0.5m probe spacing of a twin probe array has a typical depth of penetration of 0.5m to 1.0m. The collection of data at 0.5m centres with a 0.5m probe spacing provides an optimum resolution for the task.

3.4.3 Data capture

Gradiometer

The readings are logged consecutively into the data logger which in turn is daily downloaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

Earth resistance

The readings are logged consecutively into the data logger which in turn is daily downloaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Gradiometer

Processing is performed using specialist software known as *Geoplot 3*. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids.

The following schedule shows the basic processing carried out on all minimally processed gradiometer data used in this report:

1. *Despike* (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

Geoplot parameters:

X radius = 1, y radius = 1, threshold = 3 std. dev.
Spike replacement = mean

2. *Zero mean traverse* (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

Geoplot parameters:

Least mean square fit = off

Earth resistance

The processing was carried out using specialist software known as *Geoplot3*. Minimal processing involves 'despiking' of high contact resistance readings and edge matching to remove grid edge discontinuities. Full processing involves the passing of the data through a high pass filter. This has the effect of removing the larger variations in the data often associated with geological features. The net effect is aimed at enhancing the archaeological or man-made anomalies contained in the data.

The following schedule shows the processing carried out on the minimally processed resistance plots.

<i>Despike</i>	<i>X radius = 1</i> <i>Y radius = 1</i> <i>Spike replacement</i>
<i>Edge Match</i>	<i>Grid number</i> <i>Grid edge</i>

The fully processed data then follows with a high pass filter which uses the schedule below:

<i>High pass filter</i>	<i>X radius = 10</i> <i>Y radius = 10</i> <i>Weighting = Gaussian</i>
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3.5.2 Presentation of results and interpretation

Gradiometer

The presentation of the data for the survey involves a print-out of the raw data both as grey scale and colour plots (Figures 3 & 4), together with the abstraction and interpretation of magnetic anomalies (Figure 5).

Earth resistance

The presentation of the data for the site involves a print-out of the raw data as a grey scale plot, together with a grey scale plot of the processed data (Figure 6). Anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing (Figures 6).

A combined interpretation plot of both data sets is shown in Figure 7.

4 RESULTS

The following list of numbered anomalies refers to numerical labels on the interpretation plots (Figures 5-7).

Probable Archaeology

1. A strong positive magnetic curvilinear feature associated with a strong negative curvilinear feature. There is also a strip of weaker negative responses running parallel to the positive feature along the southern edge. These anomalies are interpreted as a ditch and associated ploughed out bank on the north side and a possible minor ploughed out bank along part of the south side. This feature is visible on aerial photographs seen with Google Earth.
2. Two low resistance area anomalies indicating a probable ditched feature. Appears to correlate closely with a region along the length of Anomaly 1.

Possible Archaeology

3. Patchy areas of high resistance anomalies with associated moderately high resistance area anomalies lying in close proximity. These anomalies appear to correlate loosely with the eastern end of Anomaly 1.
4. Moderately high resistance area anomalies appearing in close relation to Anomaly 1 at the eastern end.
5. **5a.** A cluster of positive magnetic anomalies with associated weak positive anomalies and a small area of weak negative responses appear to the eastern edge of the survey area. These appear to be a series of possible pits or ditches.
5b. A high resistance area anomaly which appears to correlate closely with the positive magnetic anomalies identified in 5a. This suggests it could relate to pitting and/or ditching.
6. A small area of weak positive magnetic responses of unknown origin in the south of the survey area.
7. A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. Although most of these are likely to be modern rubbish, some may be of archaeological interest. Particular attention may be paid to those found in association with other potentially archaeological anomalies.

Other Anomalies

8. Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker

archaeological anomalies and have almost certainly masked the western end of anomaly 1.

9. A line of weak dipolar responses most likely relating to field drainage.

5 CONCLUSION

The detailed magnetic survey and the targeted earth resistance survey have identified an area of probable archaeology in the form of a curvilinear ploughed out bank and ditch feature. There are patches of high and low resistance lying close along the length of this feature which may be associated.

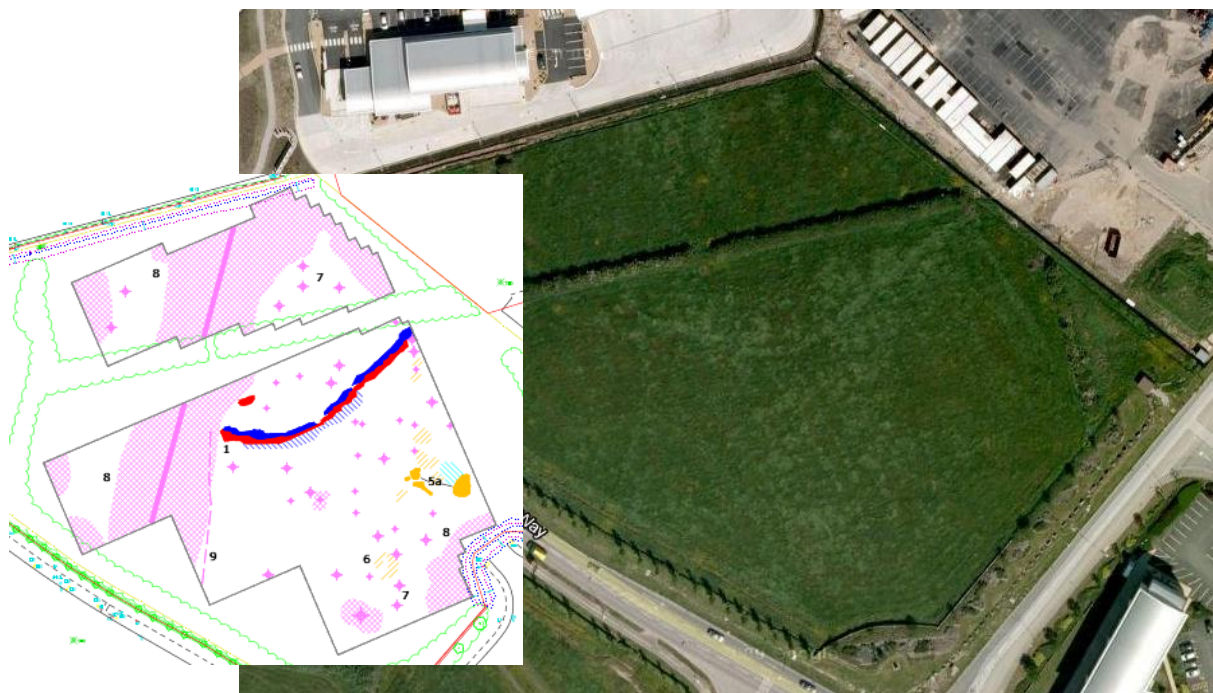


Plate 2: Screen grabs of Figure 5 and Google Earth. A crop mark at the position of the curvilinear anomaly is clearly seen in an aerial photograph.

An area of possible archaeology has been identified in both datasets to the east of the survey area. The positive magnetic anomaly suggests a cut feature, but the high resistance anomaly suggests hard compacted ground. This could suggest a cut and backfilled feature and may warrant further intrusive investigation to determine its origins.

The water main runs south west to north east across the western half of site and has created an area of magnetic disturbance in this region of the survey area. There are also numerous magnetic spikes dotted across site; some of which may be worthy of further investigation but most are likely to be of modern ferrous origin.

6 REFERENCES

British Geological Survey website:

<http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps>.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 5 Southwest England*.

APPENDIX A – Basic principles of magnetic survey

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremnant* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremnance is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremnant archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

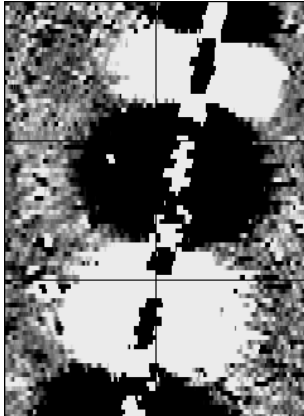
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically either 0.5 or 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

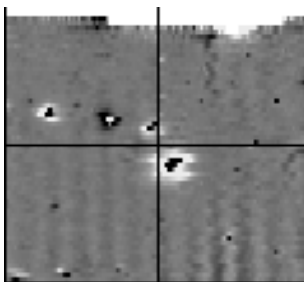
APPENDIX B – Glossary of magnetic anomalies

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

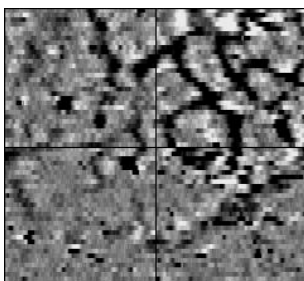


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

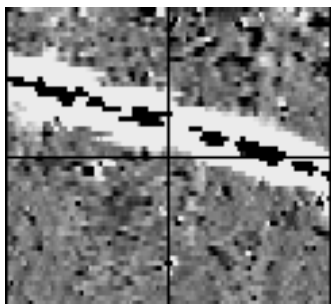
See bipolar and dipolar.

Positive linear



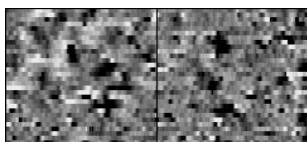
A linear response which is entirely positive in polarity. These are usually related to infilled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response



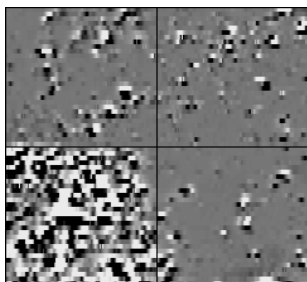
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area



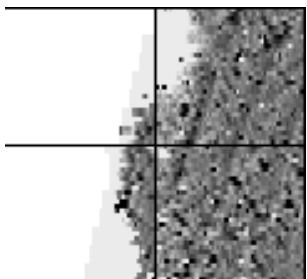
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by infilled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



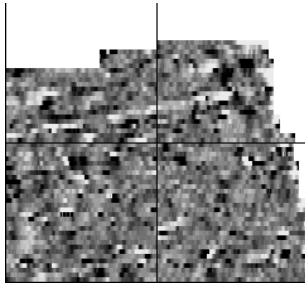
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low ($\pm 3\text{nT}$) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly ($\pm 250\text{nT}$) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

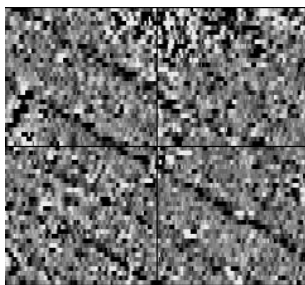


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing, clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

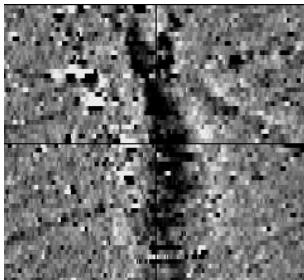
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a 10m² area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Trace plots are used to show the amplitude of response.

Thermoremanent response

A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately ± 100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred *in situ* (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.

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Licencee:
Stratascan Ltd.
Vineyard House
Upper Hook Road
Upton Upon Severn
WR8 0SA

OS 100km square = SD



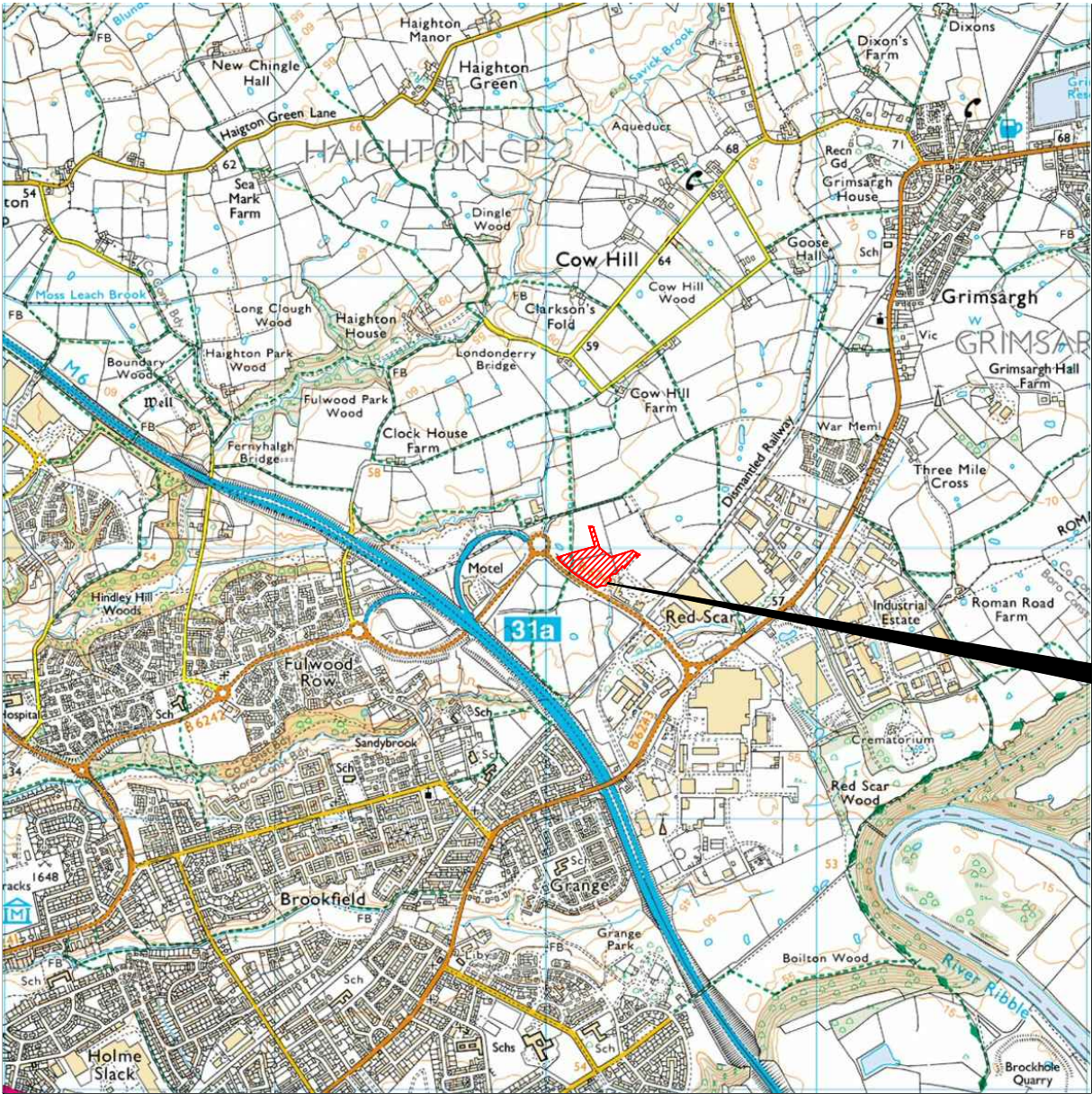
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Survey Area

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59

Amendments

Issue No.	Date	Description
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Site centred on NGR SD 571 329

Client
OXFORD ARCHAEOLOGY NORTH

Project Title Job No. 2985
PRESTON, LANCASHIRE

Subject
LOCATION PLAN OF SURVEY AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY
AND ENGINEERING

VINEYARD HOUSE T: 01684 592266
UPTON UPON SEVERN E: info@stratascan.co.uk
WR8 0SA www.stratascan.co.uk

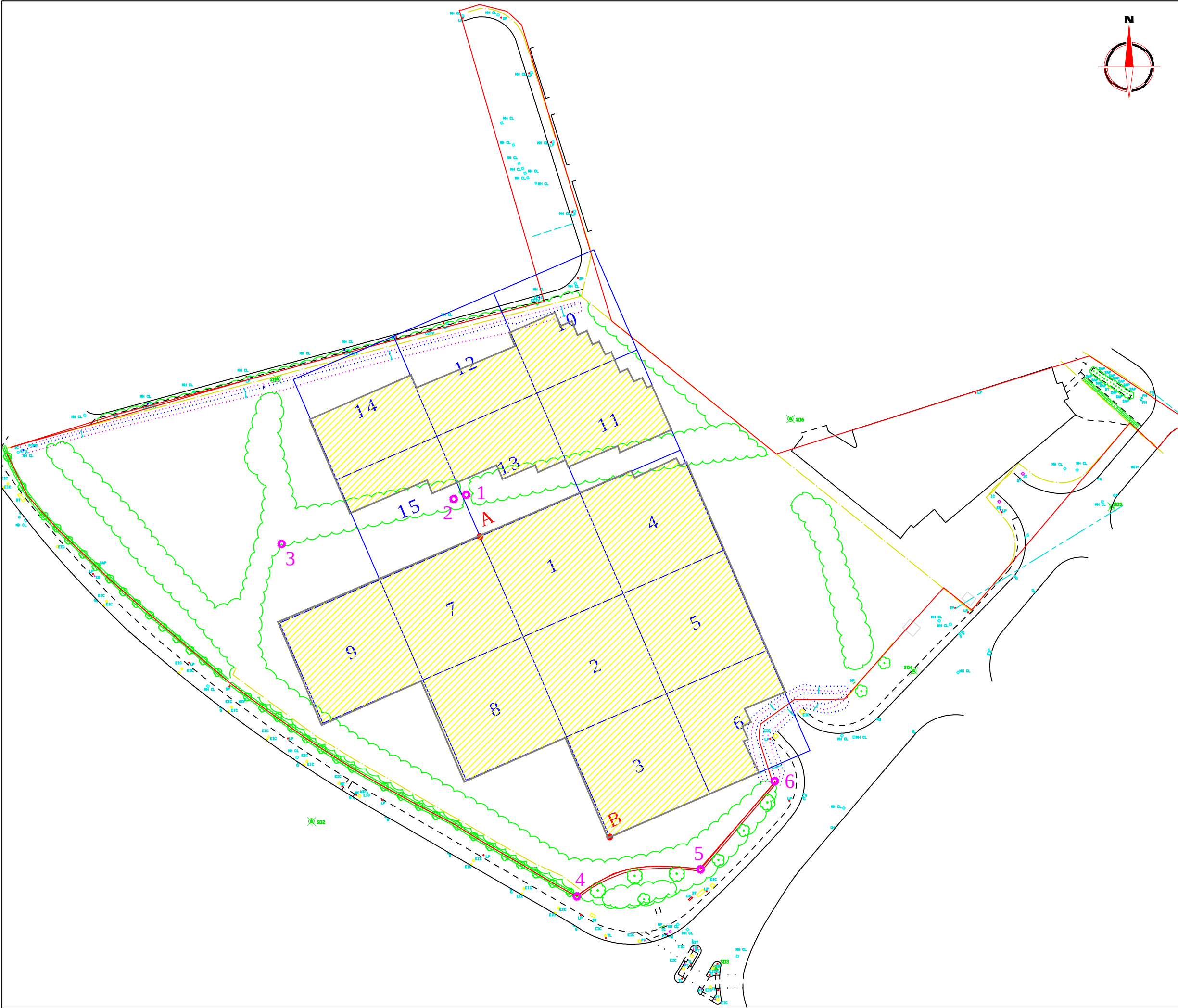


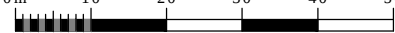
SUMO
GROUP
MEMBER

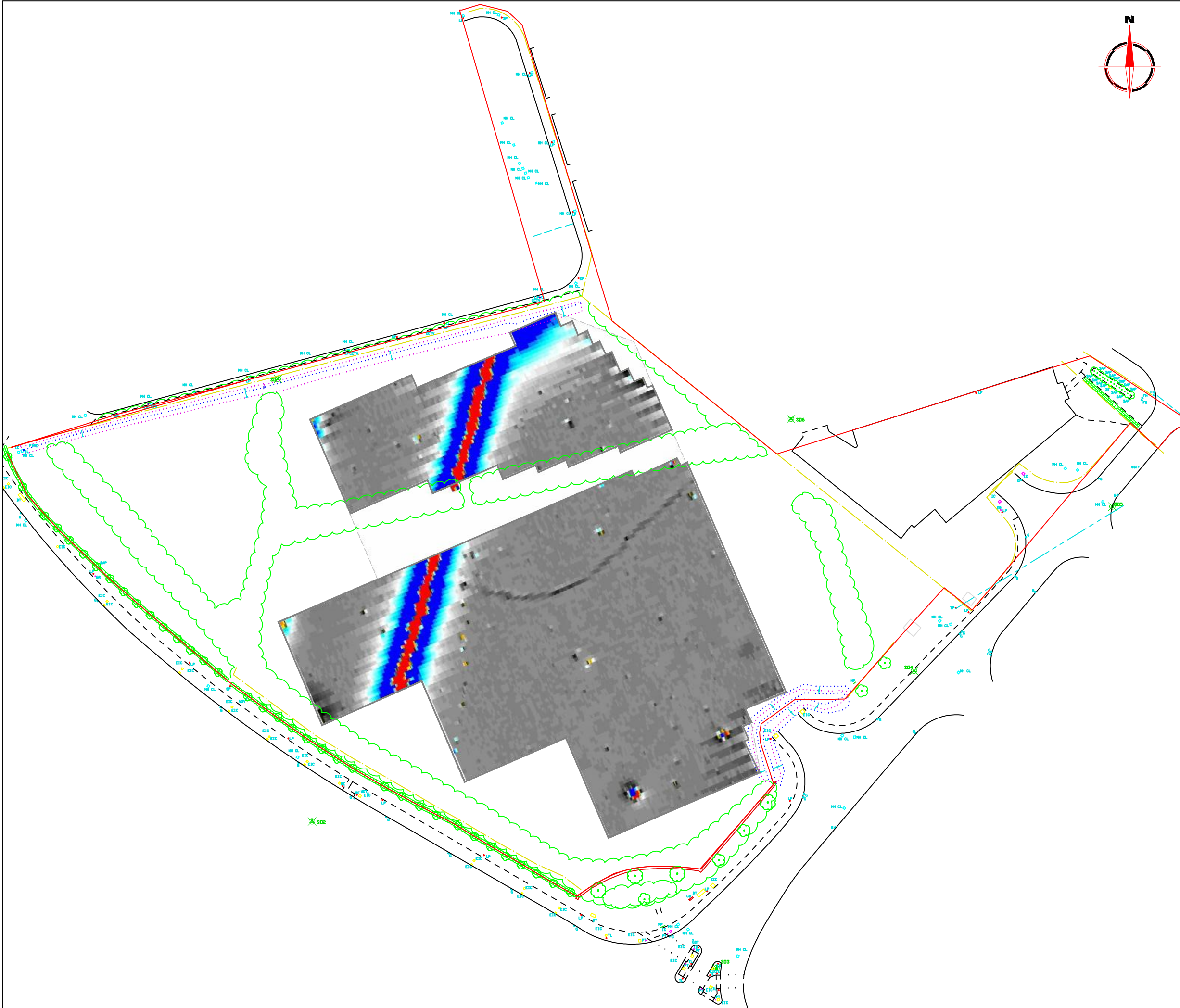


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Plot A3	Checked by PPB	Issue No. 01
Survey date OCT 2011	Drawn by MB	Figure No. 1



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© Stratascan Ltd - 2011					
OS GRID REFERENCES					
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B-4	18.67m	B-5	26.60m	B-6	48.05m
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B	357190.26, 432870.81				
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	GRADIOMETRY SURVEY AREA				
	RESISTANCE SURVEY AREA				
A-B	BASELINE				
1-6	REFERENCE POINTS				
Client					
OXFORD ARCHAEOLOGY NORTH					
Project Title					
PRESTON, LANCASHIRE					
Job No. 2985					
Subject					
LOCATION OF SURVEY GRIDS AND REFERENCING					
STRATASCAN™ GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING VINEYARD HOUSE UPTON UPON SEVERN WR8 0SA T: 01684 592266 E: info@stratascan.co.uk www.stratascan.co.uk  sumo Survey Services  SUMO GROUP MEMBER  IMS ISO 9001 certified  UKAS ISO 14001 certified  UKAS ISO 14001 certified  UTILITIES PREQUALIFICATION SCHEME					
Scale					
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OCT 2011		MB		2	

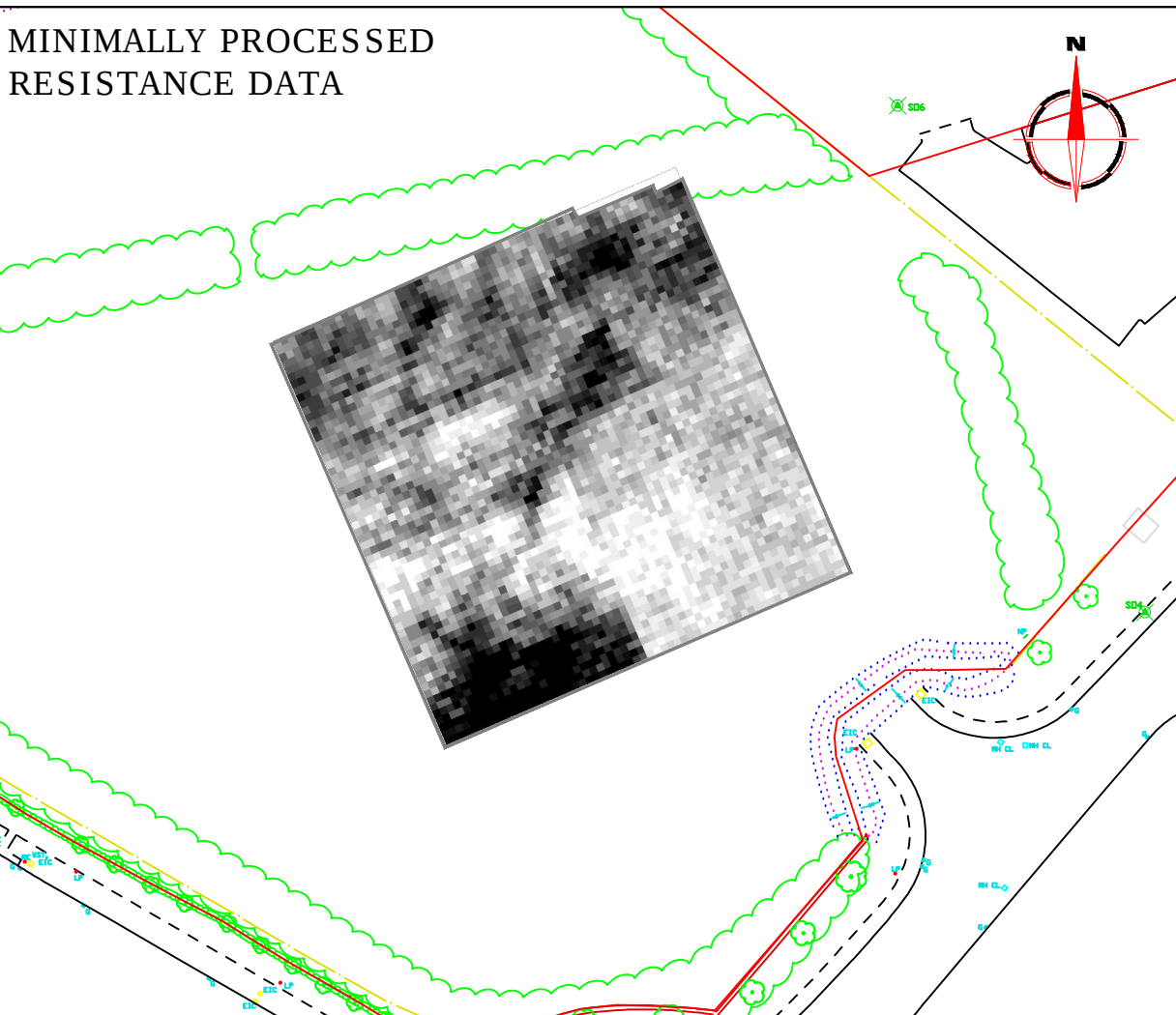


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© Stratascan Ltd - 2011		
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Minimum -250nT (blue)		
Client		
OXFORD ARCHAEOLOGY NORTH		
Project Title		Job No. 2985
PRESTON, LANCASHIRE		
Subject		
COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES		
STRATASCAN™ GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING VINEYARD HOUSE UPTON UPON SEVERN WR8 0SA T: 01684 592266 E: info@stratascan.co.uk www.stratascan.co.uk		
EUROPEAN GPR ASSOCIATION THE SURVEY ASSOCIATION REGISTERED ORGANISATION UVDB UTILITIES PREQUALIFICATION SCHEME sumo SUMO GROUP MEMBER ims ISO 9001 certified UKAS ISO 14001 certified		
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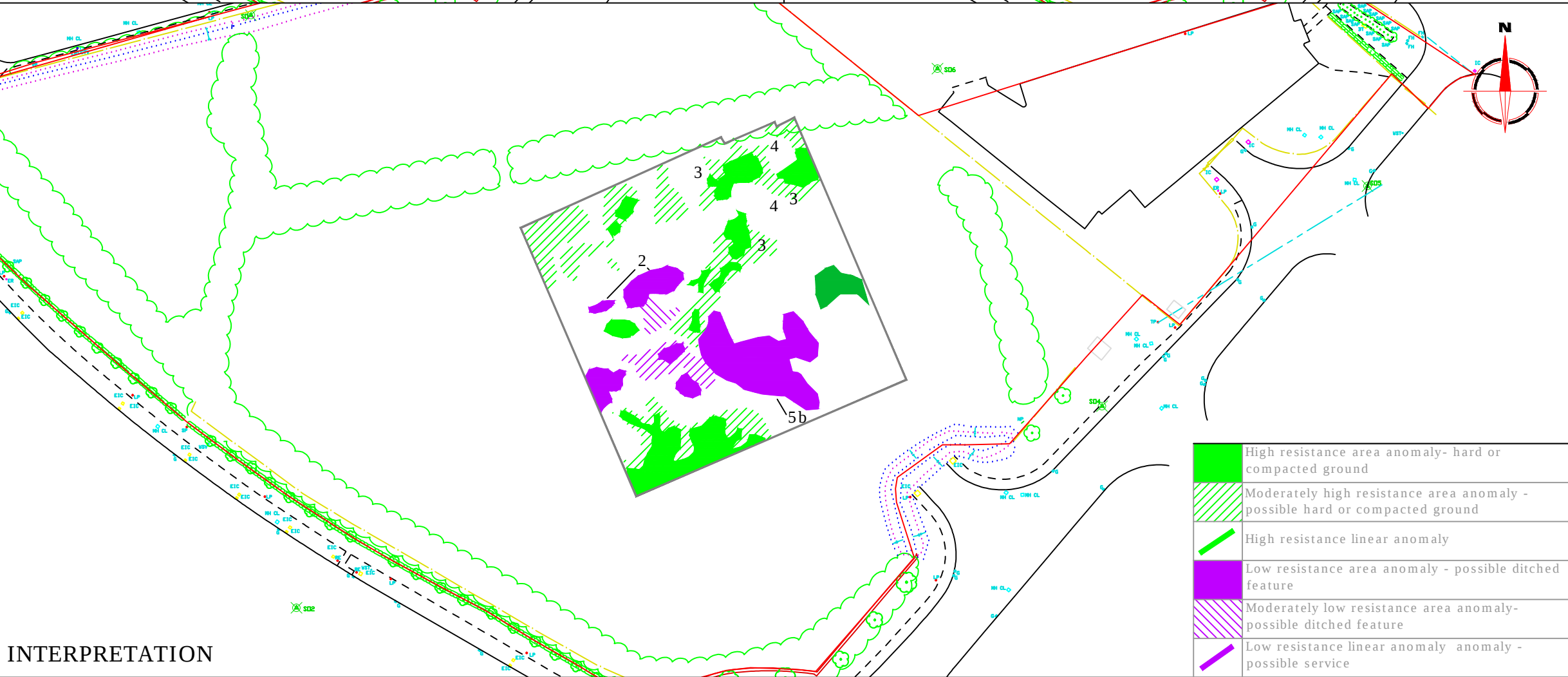
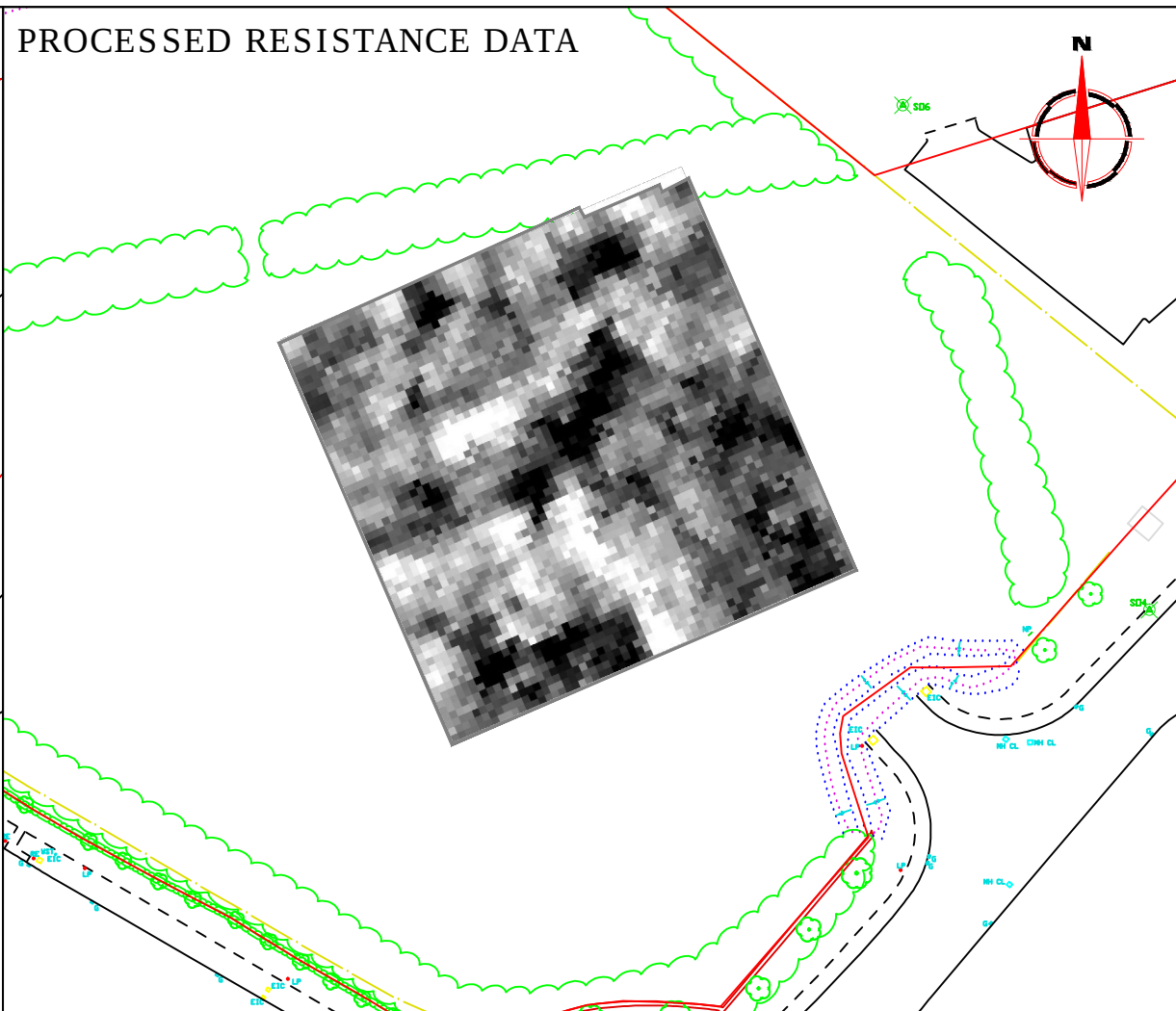


Amendments		
Issue No.	Date	Description
-	-	-
-	-	-
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KEY		
PROBABLE ARCHAEOLOGY		
	Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin	
	Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin	
	Moderate strength discrete anomaly - probable thermoremanent feature	
	Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow	
POSSIBLE ARCHAEOLOGY		
	Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin	
	Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin	
	Moderate strength discrete anomaly - possible thermoremanent feature	
	Magnetic spike - probable ferrous object	
OTHER ANOMALIES		
	Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing	
	Linear anomaly - probably related to pipe, cable or other modern service	
	Linear anomaly - possibly related to land drain	
	Magnetic disturbance associated with nearby metal object such as service or field boundary	
	Strong magnetic debris - possible disturbed or made ground	
	Scattered magnetic debris	
	Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin	
Client		
OXFORD ARCHAEOLOGY NORTH		
Project Title		
Job No. 2985		
PRESTON, LANCASHIRE		
Subject		
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES		
STRATASCAN™ GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING VINEYARD HOUSE UPTON UPON SEVERN WR8 0SA T: 01684 592266 E: info@stratascan.co.uk www.stratascan.co.uk EUROPEAN GPR ASSOCIATION THE SURVEY ASSOCIATION REGISTERED ORGANISATION UVDB UTILITIES PREQUALIFICATION SCHEME SUMO GROUP MEMBER		
Scale		
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A3	PPB	01
Survey date	Drawn by	Figure No.
OCT 2011	MB	5

MINIMALLY PROCESSED
RESISTANCE DATA



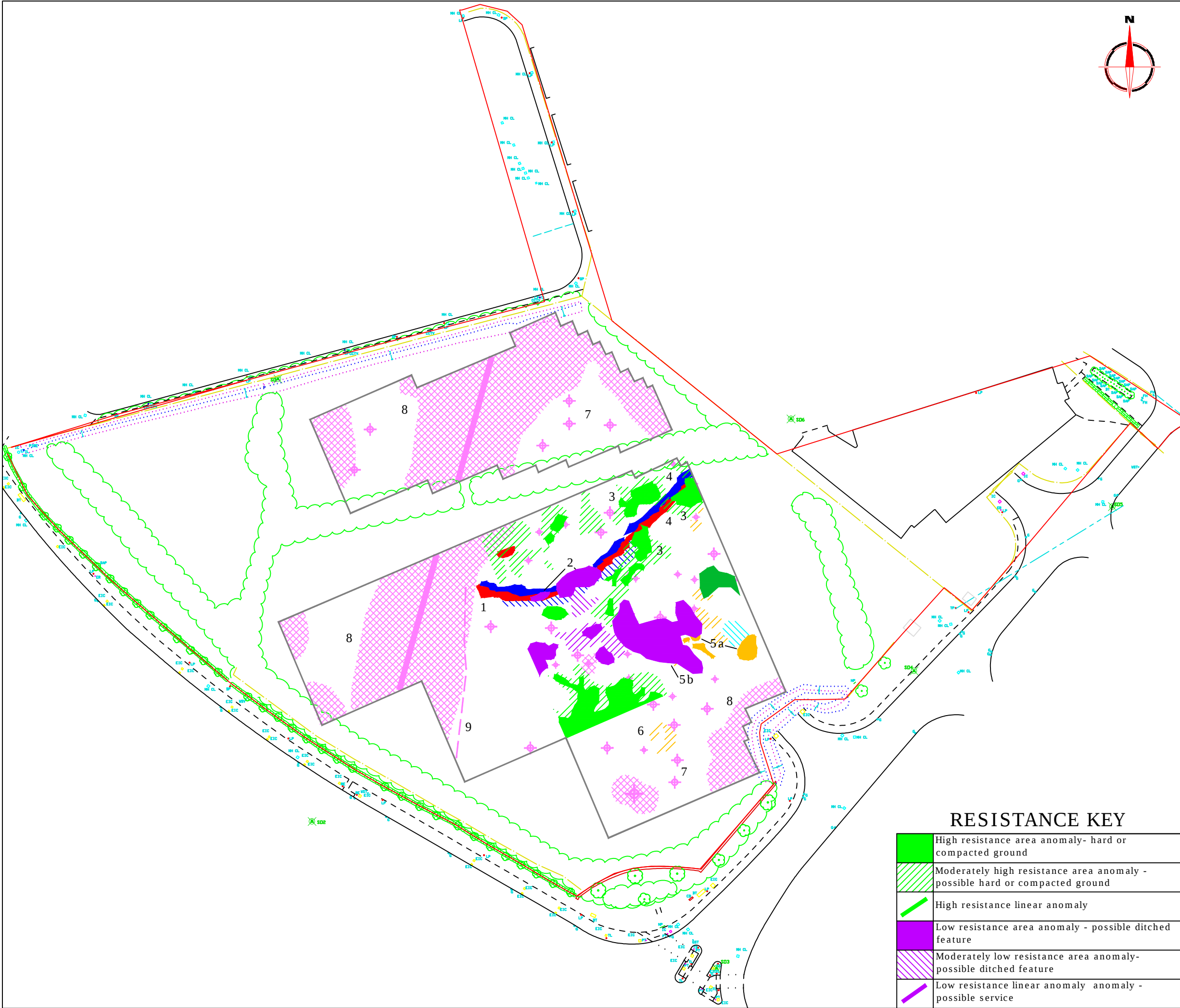
PROCESSED RESISTANCE DATA



INTERPRETATION

Amendments

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+28Ω	+36.5Ω	+28Ω
Processed Plotting parameters Maximum +34Ω (black) Minimum +29Ω (white)		
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Client OXFORD ARCHAEOLOGY NORTH		
Project Title PRESTON, LANCASHIRE		Job No. 2985
Subject PLOT OF RAW AND PROCESSED RESISTANCE DATA AND INTERPRETATION		
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Survey date OCT 2011	Drawn by MB	Figure No. 6



Amendments		
Issue No.	Date	Description
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GRADIOMETRY KEY		
PROBABLE ARCHAEOLOGY		
	Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin	
	Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin	
	Moderate strength discrete anomaly - probable thermoremanent feature	
	Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow	
POSSIBLE ARCHAEOLOGY		
	Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin	
	Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin	
	Moderate strength discrete anomaly - possible thermoremanent feature	
	Magnetic spike - probable ferrous object	
OTHER ANOMALIES		
	Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing	
	Linear anomaly - probably related to pipe, cable or other modern service	
	Linear anomaly - possibly related to land drain	
	Magnetic disturbance associated with nearby metal object such as service or field boundary	
	Strong magnetic debris - possible disturbed or made ground	
	Scattered magnetic debris	
	Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin	
Client		
OXFORD ARCHAEOLOGY NORTH		
Project Title		Job No. 2985
PRESTON, LANCASHIRE		
Subject		
COMBINED INTERPRETATION		
STRATASCAN™ GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING VINEYARD HOUSE UPTON UPON SEVERN WR8 0SA T: 01684 592266 E: info@stratascan.co.uk www.stratascan.co.uk THE SURVEY ASSOCIATION UTILITIES PREQUALIFICATION SCHEME SUMO GROUP MEMBER		
Scale	0m 10 20 30 40 50	
1:1000		
Plot	Checked by	Issue No.
A3	PPB	01
Survey date	Drawn by	Figure No.
OCT 2011	MB	7

APPENDIX 3: CONTEXT LIST

Trench	Context Number	Description
1	100	Dark brown clay-silt topsoil
1	101	Dark brown clay-silt subsoil
1	102	Mid-orange-yellow sandy-clay natural geology
1	103	Void
1	104	Curvilinear drainage gully
1	105	Secondary natural silting of gully 104
1	106	Narrow, shallow gully, possible plough scar
1	107	Fill of gully/plough scar 106
1	108	Shallow drainage gully
1	109	Secondary natural silting of gully 108
1	110	Shallow gully, possible plough scar
1	111	Fill of gully/possible plough scar 110
2	200	Dark blackish-brown clay-silt topsoil
2	201	Mottled orange-brown and greyish-blue silty-clay natural geology
3	300	Dark brownish-grey humic silt topsoil
3	301	Dark brownish-grey clay-silt subsoil
3	302	Yellowish-brown sandy-clay natural geology
3	303	Deliberate backfill of gully 304
3	304	Curvilinear gully
4	400	Dark greyish-brown humic silt topsoil
4	401	Dark greyish-brown humic silt subsoil
4	402	Boulder clay natural geology
4	403	Deliberate mixed backfill of ditch 404
4	404	Boundary ditch, possible hedgerow
4	405	Deliberate backfill of ditch 409
4	406	Secondary silting of ditch 409
4	407	Secondary silting of ditch 409
4	408	Redeposited natural within ditch 409 , perhaps slumpage from associate bank
4	409	Boundary ditch, possible hedgerow
4	410	Secondary water-borne silt within gully 411
4	411	Drainage gully
4	412	Secondary silting of gully 414
4	413	Primary silting of gully 414
4	414	Drainage gully

4	415	Mixed backfill of ditch 404
4	416	Backfill of gully 417
4	417	Gully running parallel to ditch 404 , probably contemporary
5	500	Dark brown clay-silt topsoil
5	501	Dark brown silty-clay subsoil
5	502	Mid-yellow and grey sandy-clay natural geology
5	503	Boundary ditch
5	504	Secondary silting of ditch 503
5	505	Backfill of ditch 503
5	506	Void
5	507	Secondary silting of ditch 503
6	600	Dark blackish-brown clay-silt topsoil
6	601	Mid-pinkish orange silty-clay natural geology
7	700	Dark brown clay-silt topsoil
7	701	Mottled brownish-grey and light grey sandy-clay natural geology
7	702	Boundary ditch
7	703	Primary silting of ditch 702
7	704	Secondary silting of ditch 702
7	705	Deliberate backfill of ditch 702
7	706	Final silting of ditch 702
8	800	Dark brown clay-silt topsoil
8	801	Mid-blueish-grey silty-clay natural geology
9	900	Mid-blackish-brown clay-silt topsoil
9	901	Hard compacted silty-clay gravel natural geology
9	902	Light blueish-brown silty-clay natural geology

APPENDIX 4: FINDS CATALOGUE

Context no	Object Record No	Material	Type	Quantity	Description	Date
111	1001	Ceramic	Vessel	1	Small body fragment of self-glazed redware	Nineteenth century or later
402	1000	Ceramic	Vessel	2	Base fragment of porcelain cup; rim fragment of transfer-printed, white earthenware cup	Nineteenth century or later
405	1002	Ceramic	Vessel	1	Body fragment of white earthenware	Nineteenth century or later
405	1003	Ceramic	Building material	1	Small undiagnostic fragment	Not closely dateable
504	1004	Ceramic	Vessel	1	Base fragment of grey stoneware marmalade jar	Nineteenth century or later
504	1005	Ceramic	Building material	1	Small undiagnostic fragment	Not closely dateable

APPENDIX 5: PALAEOENVIRONMENTAL ASSESSMENT RESULTS

Assessment results of the plant remains and charcoal. Recorded on a scale of + to +++, where + is rare (up to 5 items) and +++ is abundant (>100 items).

havm = heat affected vesicular material, cbm = ceramic building material, DO = dating only

Sample no	Context no	Cut no	Feature type	Flot vol (ml)	Matrix	CPR	WPR/uncharred seeds	Charcoal	Potential CPR	Potential WPR	Potential charcoal
100	105	104	Gully	50	Modern roots +++, coal +	-	++++ mostly <i>Juncus</i> sp, also <i>Ranunculus repens</i> -type and <i>Rumex</i> sp	Total charcoal ++, >2mm ++	no	DO?	no
101	107	106	Plough scar?	<5	Modern roots +++, coal +, cbm +	-	+ <i>Rumex</i> sp, Cyperaceae	Total charcoal +, >2mm + poorly preserved <i>Quercus</i> sp	no	no	no
102	109	108	Gully	50	Modern roots +++, coal +, havm +, insect egg fragments ++	+ <i>Corylus</i> nut fragment, cf tuber	+ <i>Ranunculus repens</i> -type	Total charcoal +++, >2mm +++++ poorly preserved cf <i>Quercus</i> sp, some semi-charred	DO	no	no
300	303	304	Gully	300	Modern roots +++, coal +, havm ++, insect fragments +	-	+ Cyperaceae, cf <i>Isolepis setacea</i>	Total charcoal +++, >2mm ++ poorly preserved cf <i>Alnus/Cor ylus</i> and <i>Quercus</i> sp	no	no	DO
400	406	409	Ditch	40	Modern roots +++++	-	+ Poaceae	Total charcoal +, >2mm + indeterminate and <i>Quercus</i> sp	no	no	no
401	410	411	Gully	20	Modern roots +++, coal +, havm ++, insect egg fragments +	-	++ <i>Juncus</i> sp	Total charcoal ++, >2mm + cf diffuse porous	no	no	no
402	412	414	Gully	100	Modern roots +++, coal +, havm	-	-	Total charcoal ++, >2mm +	no	no	no

					++, insect fragments +			indeterminate and diffuse porous			
403	415	404	Ditch	5	Modern roots +++++, coal +, havm +, mineralised twig + wood/twigs +	-	+ <i>Rubus fruticosus</i> , <i>Lamium</i> sp	Total charcoal +, >2mm + Indeterminate	no	no	no
404	416	404	Ditch	100	Modern roots +++++, havm +, insect fragments +	+ Cyperaceae stem fragments	+ <i>Rubus fruticosus</i>	Total charcoal +++, >2mm ++ indeterminate and diffuse porous, possible charred bark	no	no	DO
700	703	702	Ditch	100	Modern roots ++, amorphous organic plant remains +++++, wood ++, coal +, havm ++, insect egg fragments ++	-	++ <i>Euphorbia</i> cf <i>helioscopia</i> , <i>Viola</i> sp, <i>Juncus</i> sp	Total charcoal ++, >2mm ++ diffuse porous, includes charred bark and semi-charred wood	no	DO?	DO
701	704	702	Ditch	50	Modern roots ++, wood +, havm +, insect fragments +	-	+++ <i>Rubus fruticosus</i> , <i>Viola</i> sp, Cyperaceae, <i>Juncus</i> sp	-	no	DO?	no